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O'SHAUGHNESSY DAM

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HETCH HETCHY WATER AND POWER

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A N N U A L R E P O R T
FISCAL YEAR 1975-76

HETCH HETCHY WATER AND POWER SYSTEM
AND
BUREAU OF LIGHT, HEAT AND POWER

O. L. MOORE
GENERAL MANAGER



CITY AND COUNTY OF SAN FRANCISCO

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ANNUAL REPORT
FISCAL YEAR 1975-76

HETCH HETCHY WATER AND POWER DEPARTMENT

ORAL L. MOORE - General Manager

This report is respectfully dedicated to Hetch Hetchy employees, past and present, whose devoted and conscientious efforts have made possible these accomplishments for San Francisco.



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The picture on the front cover of O'Shaughnessy Dam was taken on June 7, 1923, before the dam was raised an additional 85.5 feet.

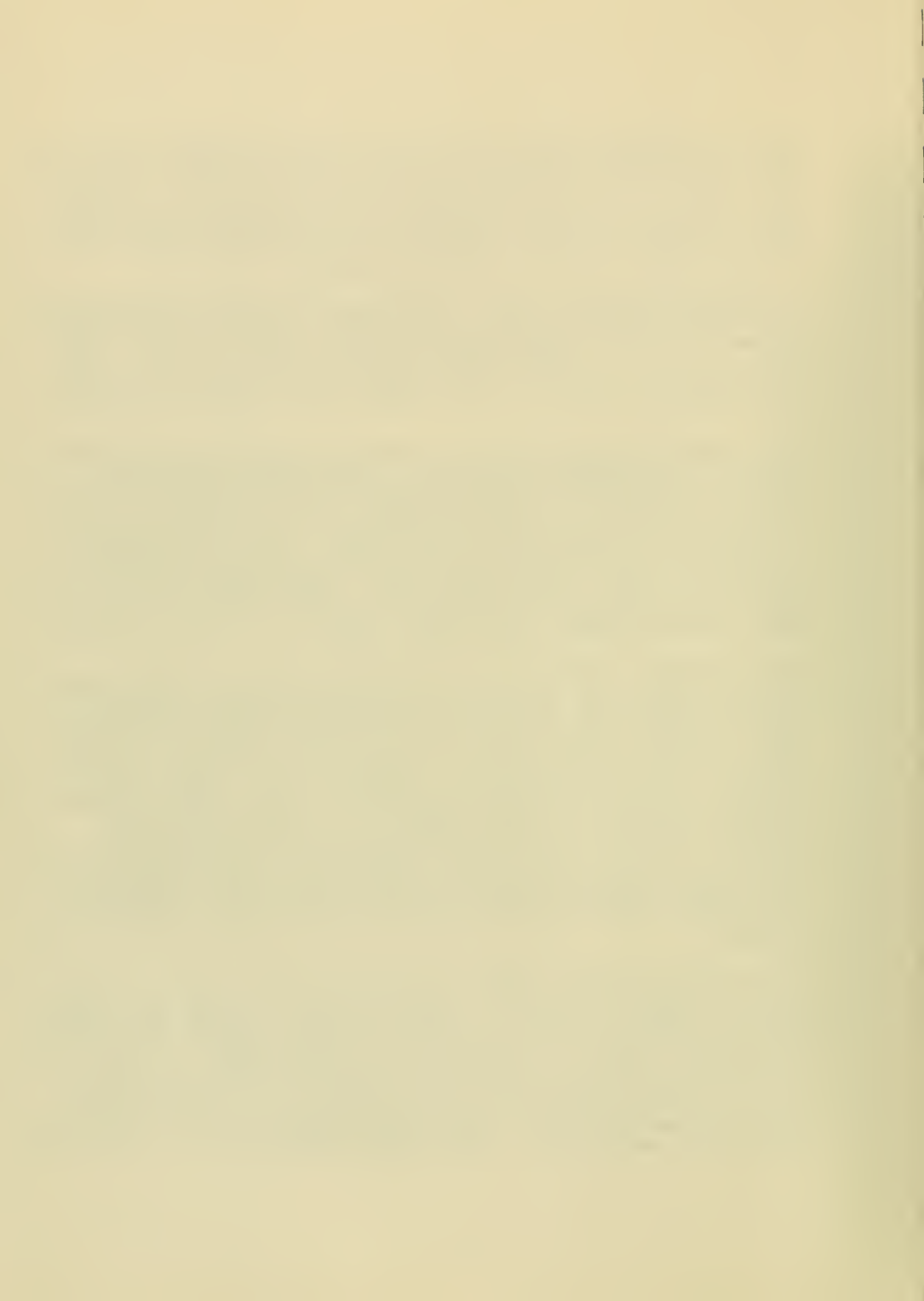
In the 75th year since the first lands were acquired for the Hetch Hetchy Water and Power system, and in the midst of a very dry year, it is fitting to recognize the foresight, industry and dedication of the people who conceived, built and operate that system. One and three-quarter million San Francisco Bay Area residents receive a supply of first quality water from Hetch Hetchy. How did it all come about?

The Metropolitan Bay Area of 1901 consisted of a San Francisco of 350,000 population, and a collection of small, quiet towns around the Bay. Booming growth, a high level of civic pride, and the belief of every citizen that San Francisco was to be the leading metropolis of the Pacific Coast were the keynotes of the times.

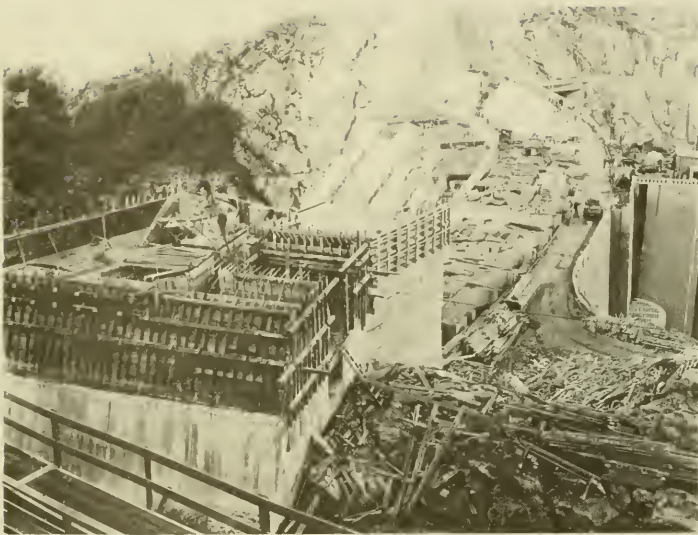
Some dissatisfaction with the commercial supplier, the Spring Valley Water Company, prevailed, occasioned by high rates, periodic shortages and recurring water quality problems. That dissatisfaction had prompted language in the Charter enacted in 1900, setting as a goal the acquisition and construction of a municipally owned water supply system. What was needed was a plentiful, high-quality water source that would meet the area's need for at least 100 years. Looking east to the Sierra Nevada, the planners found such a source in Yosemite National Park. But the water was 150 miles away!

The "City that knows how" was determined that the water system would be built, and the first land was purchased, and water rights established, in 1901. The ensuing struggle for permission to build a dam in Hetch Hetchy valley went on for years. When the United States Congress confirmed the City's right to proceed in 1913, construction commenced on the largest such project on the Pacific Coast up to that time. After 21 years, and the expenditure of some \$100 million, the first water arrived at Crystal Springs Reservoir via the Hetch Hetchy aqueduct in 1934. The drama surrounding the leadership, politics, and the engineering and construction effort involved in the project would be worthy of an epic novel, as expansion of the system to meet water and power demand continues down to the present.

The large and complex system was designed to be built in increments as demand increased. The master plan concept of a full gravity aqueduct system to Crystal Springs, established in 1912, has been followed as the system has grown through the years to the present capacity of 300 million gallons daily. As a by-product of the falling water, hydroelectric generating capability of 340 megawatts has been constructed; a major economic asset for San Francisco. Additional elements of the system are planned for construction as the demand increases.



Today, the benefits of the Hetch Hetchy project are so matter-of-factly accepted that the public has granted the system its highest accolade: cheap, pure and plentiful water is taken for granted!



The last concrete in the original O'Shaughnessy Dam construction was poured in April, 1923, bringing the total to 398,000 cubic yards. The height of the dam was 226.5 feet above the original streambed and 344.5 feet from the bottom of the foundation. It was 298 feet thick at the base and 15 feet at the top. At the time it was constructed, it was the second highest dam in the United States, Arrowrock in Idaho winning by ten feet. Between 1934 and 1938 it was raised an additional 85.5 feet.



HIGHLIGHTS

Financially, the outcome of Hetch Hetchy's Water and Power system operation for 1975-76 was influenced by two major events which occurred during the year - one man-made and the other the result of a natural occurrence.

Breakdown of wage negotiations for the upcoming fiscal year between City's crafts workers and the Board of Supervisors resulted in a 38-day strike by City employees including electricians, plumbers, carpenters, laborers, street cleaners, etc. who are members of the crafts union. The strike began March 31, 1976 and ended on May 8, 1976. The public transit system was quickly brought to a halt when the Municipal Railway drivers joined the strike at the very outset. The importance of the Hetch Hetchy Water and Power system operation to the success or failure of the strike was not to be overlooked. It, too, was forced to shut down with all hydroelectric generators stopping production at 1400 hours on April 2, followed by complete cessation of water delivery to the San Francisco Water Department for domestic purposes.

The drought brought on by the lack of precipitation in the winter of 1975-76, resulting in the smallest snow melt runoff from the Hetch Hetchy, Cherry and Eleanor Watersheds in the 59 years of record, has left the three reservoirs at less than 60% full at the end of the report year. In order to conserve as much water as possible for domestic use in the Bay Area, the average daily power draft at Kirkwood and Moccasin Powerhouses beginning June 1, 1976, was reduced to 300 million gallons per day to coincide with the Hetch Hetchy Aqueduct capacity and the anticipated San Francisco Water Department demand for the next several months. In addition, the power draft at Holm Powerhouse was reduced to 200 cubic feet per second in order to conserve water at Lake Lloyd so that, if later conditions require, such water can be directed into the Hetch Hetchy Aqueduct.

HETCH HETCHY ORGANIZATION AND FUNCTIONS

Under policies established by the San Francisco Public Utilities Commission, the HETCH HETCHY WATER AND POWER DEPARTMENT and the BUREAU OF LIGHT, HEAT AND POWER serve the City and County of San Francisco in the dual function of operating department and service bureau.

Hetch Hetchy is a municipally-owned system of storage reservoirs and aqueducts which collects water from the Tuolumne River watershed and delivers it to the San Francisco Water Department. As a by-product of falling water, Hetch Hetchy operates and maintains hydroelectric generating stations and high voltage transmission lines for the production and distribution of electric energy.

Through its Transit Power Division, Hetch Hetchy has funded, operated, maintained and provided improvements for the electric facilities of the San Francisco Municipal Railway since July 1, 1969.

In order to handle this additional responsibility, Hetch Hetchy assumed control of the equipment and personnel of the Overhead Lines and Motive Power Sections of the Municipal Railway.

All of Hetch Hetchy's expenses, including those of the Transit Power Division, are supported by water and power revenues.

The Bureau of Light, Heat and Power administers contracts for furnishing electric, gas and steam services to municipal departments and handles monthly billings. It also administers contracts for furnishing street lighting services and for operation and maintenance of City-owned street lighting. Financing, design and construction of City-owned street lighting improvements are under the jurisdiction of the Department of Public Works, and plans for these improvements must be approved by the Public Utilities Commission through this Bureau. The Bureau is financed by appropriations from municipal departments and gas tax funds.

For fiscal year 1975-76, the Department administered budgeted funds for all purposes as follows:

<u>Budget</u>	<u>Number of Employees</u>	<u>Total Amount Appropriated</u>
Hetch Hetchy Water and Power	219	\$ 21,350,716
Hetch Hetchy Water and Power (Transit Power Division)	52	4,505,194
Bureau of Light, Heat and Power	<u>11</u>	<u>9,493,990</u>
	282	\$ 35,349,900



O'Shaughnessy Dam as it looks now.

PLANS FOR THE NEAR FUTURE

Plans for future Hetch Hetchy construction are included in the City's current Capital Improvement Plan.

Projects which will be added next year will include the following:

Cherry Eleanor Pumping Station

We have studied the possibility of installing pumps at the Cherry end of the Cherry Eleanor Tunnel. This study determined that it was economically feasible to capture, for electrical generation, water which presently spills at Lake Eleanor during the runoff season. Preliminary design work will commence this year, while the necessary permits and approvals are being obtained.

Moccasin Powerhouse Bypass

Studies are planned to make improvements on Rattlesnake Creek and Big Jackass Creek to permit the discharge of water from Priest Reservoir into the Hetch Hetchy Aqueduct for use in times of emergency when Moccasin Powerhouse is not operative.

HETCH HETCHY WATER AND POWER SYSTEM

REVENUE AND EXPENDITURES

Revenue from Hetch Hetchy Water and Power operations is derived principally from two sources:

1. Sale of electric power and energy to San Francisco Municipal departments, Modesto and Turlock Irrigation Districts in the San Joaquin Valley, and seven industrial customers.

Kaiser Cement & Gypsum Corporation	Santa Clara County
Kaiser Aluminum & Chemical Corporation	Santa Clara County
Lockheed Missiles and Space Company, Inc.	Santa Clara County
General Motors Corporation	Alameda County
IBM Corporation	Santa Clara County
Liquid Air, Inc.	Alameda County
Norris Industries, Riverbank	Stanislaus County

2. Sale of water to the San Francisco Water Department.

POWER SALES

Gross sale of electric energy amounted to \$20,224,183, up from \$18,484,718 during 1974-75. Although this revenue appears to be a new record, it does not have the same significance as the record revenue of last year. The reasons are not so obvious without knowing the following:

- (1) Much of the increase is due to the very large amount of supplementary power and energy which City had to purchase for resale and which was resold to the customers at substantially the same high price at which it was purchased.
- (2) The offset to last year's record revenue in terms of expenditure for supplementary power and energy was only \$99,734, whereas this year the offset is \$4,389,319. Therefore, from the standpoint of net earnings, the department finds itself in a much less profitable financial position than that of last year.

Power and energy delivered to all City Departments increased 1.9% over the previous year, mainly the result of increased consumption at the San Francisco General Hospital where additional power for construction of the new facilities nearly doubled the total requirements of 11,091,942 kilowatthours for 1974-75. Consumption at the Airport, usually the single largest energy consumer among the City departments, has remained substantially the same as 1974-75. The requirements for the San Francisco Water Department have again increased 9.3%, reflecting

more pumping required by the drought condition. The Municipal Railway showed a decrease of 12.2% in annual consumption over the previous year, largely as a result of the Muni shutdown during the City employees' strike.

Power and energy delivered to Modesto Irrigation District, Hetch Hetchy's largest power customer, and to Turlock Irrigation District, the third largest, increased by 17.7% and 13.6% respectively this year. These increases in purchases clearly reflect the dry year operation of the Districts' own plant where power is derived from water stored behind Don Pedro Dam.

The hope of exceeding the record generation of 1974-75 was effectively shattered by the drought and the strike. Instead, the opposite was achieved with the lowest production recorded in seven years of operation of the present project. By comparison, the 1975-76 total output of 1,640,671,000 kilowatt-hours is 20% less than the record output of 2,057,609,000 kilowatt-hours for 1974-75.

Hetch Hetchy power is sold to City Departments at cost, representing a saving to taxpayers for 1975-76 of approximately \$3.2 million compared to the cost if supplied by the local investor-owned utility.

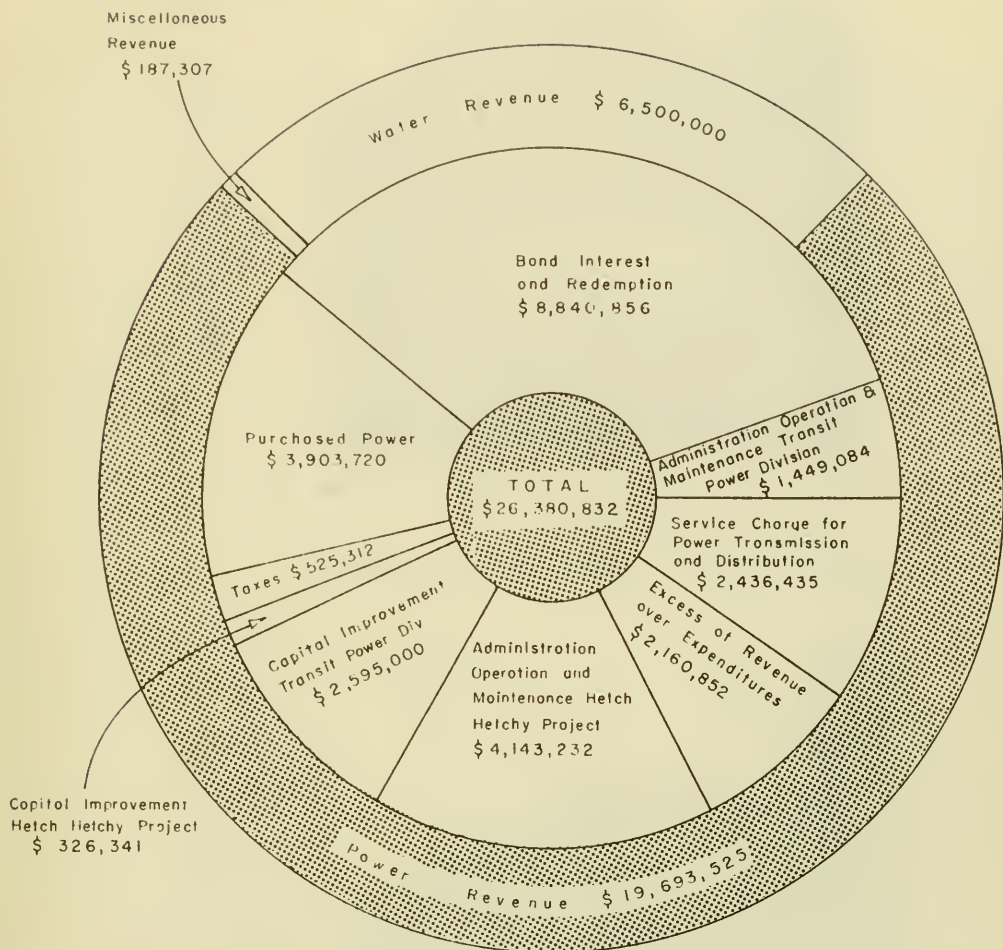
One of the benefits resulting from the June 24, 1975 Amendment Agreement with the Pacific Gas and Electric Company for wheeling Hetch Hetchy power to City's municipal customers was the reduction in energy which City has to supply to compensate the Company for losses incurred in transmission and distribution. The data for 1975-76 indicates that 33,248,681 kilowatt-hours was delivered to the Company for this purpose, almost 41,000,000 kilowatt-hours less than that required under the old agreements. This reduction in losses when sold to industrial customers at prices effective during the year returned to the City additional revenue in excess of \$650,000.

In last year's annual report, it was estimated that the new electric power rates which were scheduled to go into effect July, 1975 would increase Hetch Hetchy's power revenue for 1975-76 from sales to the municipal customers (including resale to Airport tenants) by one million dollars. Comparison of results for 1974-75 and 1975-76 has confirmed the accuracy of this prognostication. Another revision of the rates is scheduled for action by the Public Utilities Commission in July 1976. Adoption of the proposed rates will boost revenue from sales to private consumers and municipal users another \$900,000 in the upcoming fiscal year.

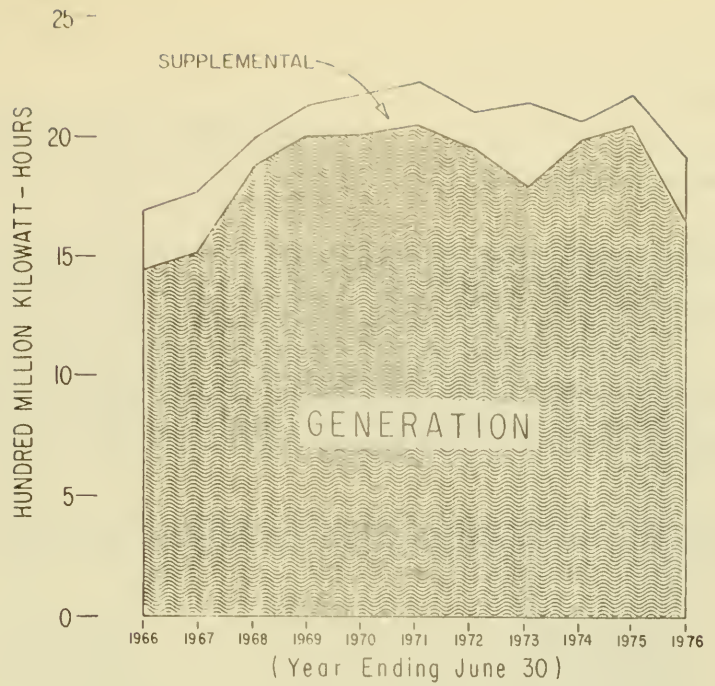
August 1975 marked the first month of higher rates for Hetch Hetchy power sold to the Modesto and Turlock Irrigation Districts under signed agreements with them dated May 22, 1973 and November 6, 1972 respectively.

WATER SALES

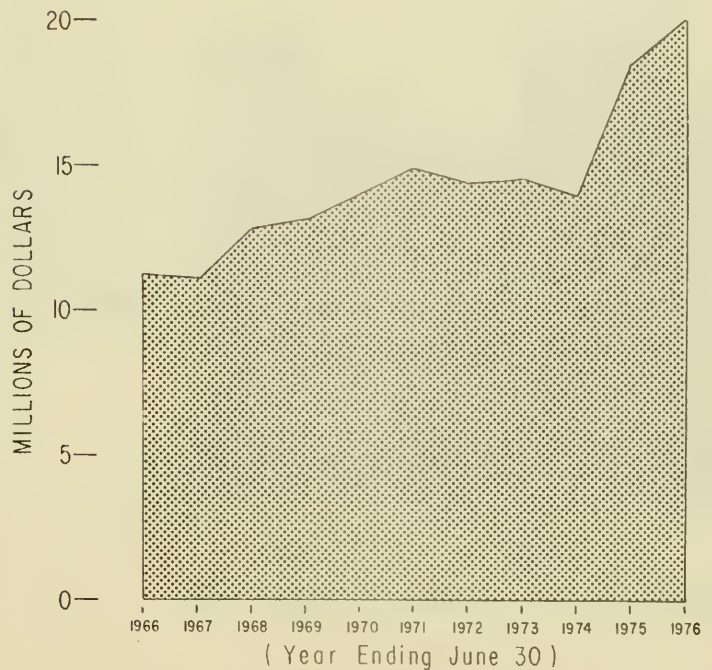
This past year, revenue from sale of water and standby service to the San Francisco Water Department was \$6,550,000, \$428,000 less than cost to Hetch Hetchy.



HETCH HETCHY REVENUES
AND EXPENDITURES
FISCAL YEAR 1975-76



HETCH HETCHY POWER SYSTEM OUTPUT



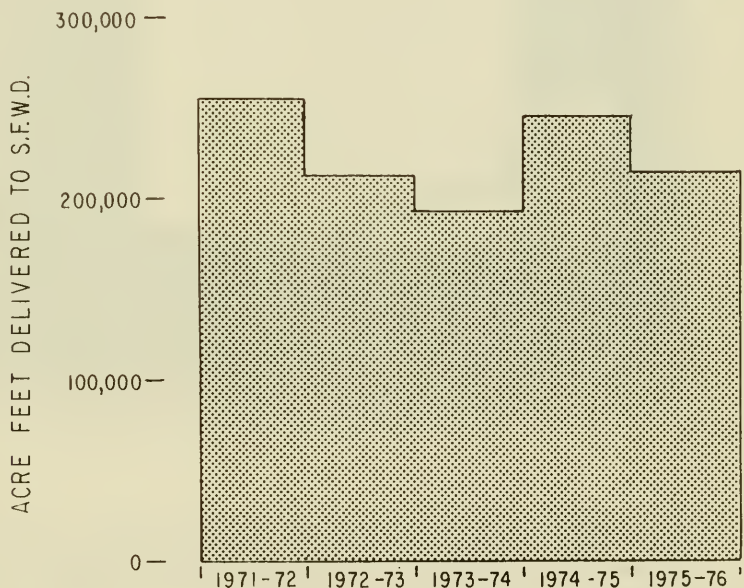
REVENUE FROM SALE OF ELECTRIC ENERGY

WATER PRODUCTION AND TRANSMISSION

Precipitation recorded for the year at our measuring stations was 58% of the long term average.

During the year, 70,086,900,000 gallons of water were diverted from the Tuolumne River watershed through the Hetch Hetchy Aqueduct to the San Francisco Water Department, representing 71% of the City's total customer consumption. In addition, 237,693,456 gallons were delivered to the United States Atomic Energy Commission at Mocho Shaft of the City's Coast Range Tunnel for use at the Lawrence Radiation Laboratory at Livermore; 49,306,396 gallons were delivered to Groveland Community Service District in Tuolumne County from the Mountain Tunnel.

Appendix Table 6 shows comparative data on precipitation, runoff, storage and delivery of the Hetch Hetchy Water Supply System.



DELIVERIES OF WATER TO
SAN FRANCISCO WATER DEPARTMENT



Woodrow Wilson, President of the United States, presented this plaque to the Honorable James Rolph, Jr., Mayor of San Francisco, expressing his support and enthusiasm for the Hetch Hetchy Act.

OPERATING AND MAINTENANCE - MOCCASIN DIVISION

HOLM POWERHOUSE UNIT NO. 2 GENERATOR

At approximately 0842 hours on Sunday, January 25, 1976, the 13,800 volt stator winding of Generator No. 2 at Dion R. Holm Powerhouse failed. Preliminary investigation indicated that approximately 8 of the 216 coils had been damaged. However, detailed examination following removal of the rotor assembly disclosed that a total of 16 coils would have to be replaced. Several of these coils were still functional, but dc high voltage testing showed that they would probably fail in a short time and were therefore deemed unacceptable for continued use. Portions of insulation on 4 field poles were also damaged by hot metal splatters from the stator windings when the failure occurred, requiring re-insulation of the affected area. All repair work was performed by departmental personnel, with supervision provided by the field engineers from Allis-Chalmers, the generator manufacturer. The repairs were completed and the generating unit returned to service by the middle of March.

A board of inquiry consisting of the senior electrical engineering staff members was formed to investigate the failure for cause and to recommend corrective measures. A final report is expected to include analyses and possible solutions to this maintenance problem whereby the reliability of the equipment can be improved.

CHERRY DAM HOLLOW JET VALVE REPAIRS

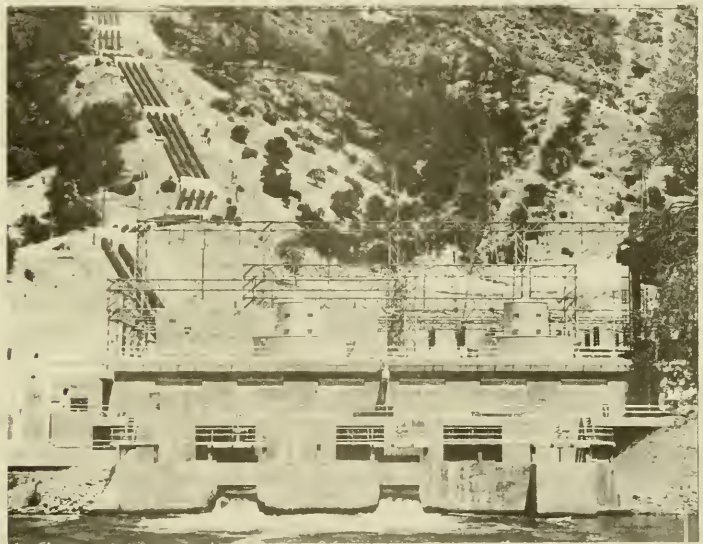
The Machine Shop repaired one of the two 60-inch valves used to release water from Lake Lloyd. The valve was leaking badly and water had gotten into the operating mechanism. If allowed to remain in place, it would have been necessary to replace the valve in a short period of time. It was necessary to build up and machine the body and plug seats, replace a brass bushing, a leather packing and two thrust bearings. Other miscellaneous repairs were made to broken or defective parts. The Mechanical Engineering Section provided engineering and procurement assistance to the Machine Shop, including inspection of work done to the plug seat by a local shop. At the end of the fiscal year, repairs were nearing completion and the valve will be available for use during the next runoff season.

LARNER JOHNSON RELIEF VALVE NO. 2 AT SAN JOAQUIN VALVE HOUSE

The relief valve on Pipeline No. 2 at the San Joaquin Valve House was removed from service during pipe cleaning and painting (HHI-5J1R). The machine shop used this time to completely rebuild the valve including braising and remachining the seats.



The old Moccasin Powerhouse completed June, 1925.



The new Moccasin Powerhouse completed May 20, 1969.

OPERATION AND MAINTENANCE - TRANSIT POWER DIVISION

The Transit Power Division is responsible for supplying the 600 volt direct current power that is necessary to operate the streetcars and trolley coaches of the San Francisco Municipal Railway.

The Transit Power Division is composed of two sections - the Motive Power Section and the Overhead Lines Section.

Motive Power Section

The Motive Power Section operates and maintains seven substations which convert electric power from 12,000 volts alternating current to 600 volts direct current by means of motor-generators, synchronous converters, and mercury arc rectifiers. (See Appendix Table 3 for statistical data.) Motive Power is also responsible for maintaining the electric motors and associated control equipment for operating the cable-winding machinery located in the Cable Car Powerhouse at Washington and Mason Streets. In addition, Motive Power does periodic inspection, cleaning, adjusting and repairing the streetcar and trolley coach recorders at Central Control of the Municipal Railway. The substations operate 24 hours per day, 365 days per year.

In anticipation of the need to assume responsibility for eighteen new substations, this section perused and commented on the wiring and control schemes proposed for these stations.

A new mimic board showing the new stations in schematic form was constructed and installed at the Bryant Substation. As new automatic stations are completed and become operational, they will be monitored and controlled from this remote location. Since Outer Mission and West Portal Stations are presently unmanned, controls for these stations were designed and installed on this new mimic board. This new status display and control board will continually be augmented with new automatic station controls until such time as it shall be superseded by a more sophisticated and flexible Supervisory Control System.

Overhead Lines Section

The primary function of the Overhead Lines Section is to maintain in satisfactory operating condition the trolley wire overhead facilities and the electric distribution system which conveys power to it. This electric distribution system consists of both overhead lines and underground cables.

Secondary functions include the maintenance of the Municipal Railway Signal Systems and the electric light and power systems of all Municipal Railway buildings.

During the fiscal year 1975-76, the Overhead Lines Section responded to 3606 emergency calls. In addition to emergency calls, this section had a regular and extensive maintenance program for overhauling all overhead and underground facilities. This section operated with three shifts per day, seven days a week. Monday through Friday, the normal workday shift was from 8:00 a.m. to 3:30 p.m. with a two-man emergency crew on the "swing" or evening shift (3:30 p.m.-10:30 p.m.) and the graveyard shift (1:00 a.m.-8:00 a.m.).

On Saturdays, Sundays and holidays a two-man emergency crew was available on each of the three eight-hour shifts; midnight to 8:00 a.m., 8:00 a.m. to 4:00 p.m., and 4:00 p.m. to midnight. Overhead and underground facilities were systematically inspected, and worn or damaged parts were replaced before they could cause accidents or malfunction of equipment.

A considerable amount of damage to overhead facilities was caused by trolley coaches de-wiring and snagging their poles in the overhead facilities and tearing them down, or by breaking the spans with the flaying poles. Such damage was repaired at no cost to the Municipal Railway. Other parties who damaged our facilities were billed for the cost of repairs. This included damage to overhead facilities caused by high loads on trucks or careless operation of crane equipment and damage to underground feeder cables by contractors digging into our duct lines. During 1975-76, responsible parties were billed for 7 damage cases totalling \$3,728.53. The Overhead Lines Section also performed work for building owners and contractors under work orders amounting to 18 jobs totalling \$44,183.13. This work included moving trolley poles to accommodate driveways; relocating trolley poles and feeders to permit construction of new buildings; temporarily removing trolley wires and feeders to permit passage of high loads; and shifting of trolley wires and feeders for various excavations.

The Overhead Lines Section engaged in many other activities of a related nature which it is especially equipped to perform. These additional duties included repairs, maintenance and construction of electrical systems in Muni's car barns, offices and shops; welding and rebuilding of worn overhead lines special work; making and rebuilding parts for switches, warning block signals, car recorders, and strand alarms for the cable car system; installing mobile radio equipment; installing streetcar and bus stop signs and public information signs.

In March 1976 the section curtailed operations for a six week period during a labor dispute involving city Craft workers.



Mr. O'Shaughnessy, City Engineer, inspecting
project on August 11, 1918.

ENGINEERING DIVISION

The Engineering Division of Hetch Hetchy Water and Power provides engineering services for the Hetch Hetchy Project and the Transit Power Division. These services include the preparation of studies, reports, cost estimates, and plans and specifications for new construction, for replacement of structures and for items of major maintenance. Surveying, inspection of construction, contract administration and payment recommendations are provided for all construction work under Hetch Hetchy Water and Power. Work of unusual magnitude or which requires special knowledge and expertise is done by engineering consulting firms which have the necessary manpower and qualifications. The Engineering Division is organized into five main sections: Structural and Civil, Electrical, Mechanical, Architectural, and Construction.

During the year, plans and specifications were prepared for the following work to facilitate and maintain Hetch Hetchy operations:

III-454 - Reconstruct Moccasin Sewage Disposal System.

A package sewage treatment plant producing an odorless effluent and sludge has been planned to replace the existing septic tank system. This project is a carryover from last year due to the slowness to acquire approval for the Federal "Clean Water Grant" which we reapplied for last year. Conceptual approval has been received. The EIR and the Project Report received approval from the State Water Resources Control Board, and we are now awaiting Federal EPA approval. The Hughes site for the effluent sprinkler field was purchased during the year.

III-477 - Moccasin Penstock Valve House.

A contract was let for the construction of a steel frame structure to enclose the butterfly valves at the head of Moccasin Penstock. This structure will provide protection and security for the valves.

III-511R - San Joaquin Pipeline No. 2, Repair Lining.

A contract was let for cleaning the interior of the pipe and applying a coal-tar lining. This work was necessary because the existing cement mortar lining, which protects the steel pipe from corrosion, has been softened by action of the soft water and the invert is being eroded away.

III-512 - San Joaquin River Valve House, Repairs and Piping.

Under this contract, which was completed during the year, new sump pumps and related piping were installed at the San Joaquin River Valve House. Also, under this contract, a leaking manifold at the valve house was repaired.



The Supervisors' inspection party on Red Mountain
Bar Cableway - July 14, 1927.

III-514 - Moccasin Administration Building, Replace Heating System.

The plans and specifications to replace the existing oil burning steam heating system and bring the electrical service at the building up to code were completed and bids opened this year. The existing heating system had become expensive to maintain and operate because of its age and its use of fuel oil. The replacement of the oil by electric heating necessitated increasing the capacity of the building electrical system, and improving it to meet code requirements.

III-539 - Repair and Paint Concrete Trolley Poles (Van Ness Avenue).

A contract has been let to repair and paint concrete trolley poles on Van Ness Avenue. This work is part of a program to rehabilitate all trolley poles in the City.

III-543 - Repair, Reroof Hetch Hetchy Buildings, Moccasin and Early Intake.

A contract was let for the reroofing of the Machine Shop and five (5) cottages at Moccasin; reroofing Kirkwood Powerhouse at Early Intake, and replacement of parapet flashing and construction of joint flashing at Holm Powerhouse near Early Intake.

III-553 - Replace, Repair and Paint Steel Trolley Poles (Mission Street).

Contract plans and specifications have been completed to replace, repair and paint steel trolley poles on Mission Street. The contract is scheduled to start in September 1976. This work is part of a continuing program to rehabilitate all trolley poles in the City.

III-554 - Construction of #47 Trolley Coach Loop at Army Street.

At the request of the Municipal Railway, a contract was let to restore the terminal loop of the #47 trolley coach line to Army Street. Several years ago the route was shorted to turn back at 25th Street in order to facilitate the construction of the freeway interchange at Army Street and Potrero Avenue. The Department of Public Works funded the project.

III-556 - Claribel Lateral Timber Bridge.

A contract was let for the construction of a timber bridge to replace an existing wood plank bridge across the Oakdale Irrigation District's lateral that has collapsed. The bridge provides access for maintenance and inspection along our right-of-way.



The Honorable James Rolph, Jr., Mayor, and City Engineer M. M. O'Shaughnessy and party at holing through of the Foot Hill Tunnel on January 5, 1934.

HH-564 - Moccasin and Tesla Portal Buildings - Exterior Repair,
Painting and Roof Preservative

A contract was let for exterior repair and painting of fourteen (14) cottages at Moccasin and caretaker's cottage at Tesla Portal including painting of Chlorinator, Pumphouse and Generator Buildings. This work also includes roof repair and painting of the vehicle storage shed at Moccasin.

Market Street Reconstruction

Plans and specifications for relocation of trolley wires on Market Street were prepared for inclusion in various DPW contracts for reconstruction of Market Street.



View looking downstream, showing the flume intake in the temporary cofferdam across Moccasin Creek, above the location of the downstream dam of the Moccasin Reservoir, July 14, 1927.



The completed Moccasin Spillway at the approximate site of the Diversion Flume Reconstruction completed March 18, 1976.

POWER IMPROVEMENT PROGRAM

Work during Fiscal Year 1975-76 under the UMTA-approved Federal Grant for the Power Improvement Program was as follows:

1. Grant Amendments

Based on our application submitted in February 1975, and updated in November 1975, Amendment No. 1, increasing the total Project Cost from \$29.6 to \$38.4 million and the Federal Grant from \$19.8 to \$26.8 million, was approved by UMTA on May 20, 1976. The additional funds were approved to cover increased costs due to inflation and revised Project requirements for the current fiscal year. An additional amendment to provide sufficient funds for the balance of the Project, increasing the total Project cost to \$50.5 million and the Federal Grant to \$36.5 million, is currently in the final stages of approval by UMTA and is expected in July 1976.

2. Electrification Project

A) Contracts

Construction commenced on Contract HH-521, Market Street Subway Electrification, Embarcadero Station to Duboce Portal on July 14, 1975. Bids were received on July 9, 1975 on Contract MR-622, Twin Peaks Tunnel Electrification, Structural Repairs and Improvements. Due to irregularities in the low bid and claim of the low bidder of ambiguity on the application of the San Francisco Plan, the Public Utilities Commission on July 29, 1975 voted to reject all bids and readvertise. The contract was readvertised as Contract MR-622R and bids were received on August 27, 1975. The contract was awarded on September 10, 1975 to Abbett Electric Corporation, San Francisco, California, who submitted the low bid of \$3,022,910, which includes an amount of \$1,416,422 for the Power Improvement Program portion of the contract. The contract was certified by the City Controller on October 10, 1975. Construction commenced on October 27, 1975.

Plans and specifications for Contract HH-531, Market Street Subway Electrification, Duboce Junction to Eureka Station, were approved by UMTA. Bids were received on February 26, 1976. The contract was awarded on March 9, 1976 to Amelco Electric, San Francisco, California, who submitted the low bid of \$195,428. The contract was certified by the City Controller on April 12, 1976. Construction commenced on April 26, 1976.

B) Design Services

The consultant, PBQ&D, Inc. and Gibbs & Hill, Inc. (PBGH) continued work on final design contract plans and specifications.

Contract plans and specifications for the PIP and TIP portions of Contract HH-536, Streetcar Overhead System, West Portal Avenue, Conversion for Pantograph Operation, and Related Street Lighting Work were completed and will be transmitted to UMTA for approval in July. This contract is scheduled for advertising in July 1976.

Plans and specifications at the 95% completion level to be incorporated into purchase orders for special Trolley Coach Streetcar Crossing Hardware were submitted by the consultant. Review was completed and comments were transmitted to the consultant for incorporation into final documents. The special hardware will be purchased by the City, due to the 6-month manufacturing lead time, and will be furnished to several installation contractors.

Plans and specifications at the 95% completion level for the streetcar overhead system conversion for pantograph operation for Contracts HH-524 ("K" Line), HH-532 ("N" Line), HH-533 ("J" Line), HH-534 ("L" Line), and HH-535 ("M" Line) were submitted by the consultant, and are being reviewed for final completion.

Plans and specifications at the 60% completion level for streetcar overhead system conversion for pantograph operation for Contract HH-530 ("J" & "N" Lines, Duboce Portal) were submitted by the consultant. Review was completed and comments were transmitted to the consultant for incorporation into the 95% completion level submittal due in July 1976.

Amendment No. 1 to the existing professional services agreement, approved by the PUC on June 24, 1975, was approved by UMTA on September 5, 1975. This amendment was executed by the consultant, PBGH, on September 19, 1975 and certified by the City Controller on October 27, 1975.

C) Cable Purchase

Orders were placed with Cyprus Wire and Cable Co., South San Francisco, California for insulated copper feeder cable to be furnished as required under the \$3,151,452 purchase contract. A total of 325,000 feet of the five types of cable, having a value of \$800,000, was received

during the fiscal year and delivered to the installation contractors for the Market Street Subway and Twin Peaks Tunnel electrification contracts, and for the Downtown, Civic Center and Church Substations equipment installation contract. An additional 85,000 feet of cable was ordered but not received as yet, for other substation and feeder undergrounding contracts.

3. Substation Project

A) Contracts

Plans and specifications for Contract HH-522, Civic Center, Church and Downtown Substations, Installation of Electrical Equipment, were approved by UMTA on July 21, 1975. Bids were received on August 14, 1975. The contract was awarded on August 28, 1975 to De Narde Construction Company, who submitted the low bid of \$652,990. The contract was certified by the Controller on September 17, 1975. Construction commenced on October 6, 1975.

Plans and specifications for Contract HH-528, Laguna Honda and Judah Substations, Construct Buildings and Install Equipment, were completed and transmitted to UMTA for approval on October 28, 1975. The plans and specifications were approved by UMTA on November 11, 1975 and bids were received on December 11, 1975. The contract was awarded on January 8, 1976 to Herrero Brothers, Inc. who submitted the low bid of \$567,913. The contract was certified by the City Controller on February 5, 1976. Construction commenced on March 1, 1976. Plans and specifications for Contract HH-529, Carl Substation, Construct Building and Install Equipment, were completed and transmitted to UMTA for approval on February 25, 1976. The plans and specifications were approved by UMTA on March 9, 1976. Bids were received on April 1, 1976. The contract was awarded on April 27, 1976 to S.J. Amoroso Construction Co., Inc., Foster City, California, who submitted the low bid of \$597,800. The contract was certified by the City Controller on June 9, 1976. Construction is scheduled to start early in July, following issuance of a building permit by the Department of Public Works.

Plans and specifications for Contract HH-544, Fillmore Substation, Construct Building and Install Equipment, were completed and transmitted to UMTA for approval on May 26, 1976. The plans and specifications were approved by UMTA on June 4, 1976. The contract was advertised with bids scheduled to be received on July 15, 1976.

B) Design Services

The Consultant Bechtel, Inc. continued design work on the substation buildings and equipment installation.

Final plans and specifications for Contract III-545, Outer Mission Substation, Install Equipment, were completed by the consultant.

Final plans and specifications for Contract III-547, San Jose Substation, Install Equipment, were completed by the consultant.

Plans and specifications at the 85% completion level for Contract III-546, Randolph Substation, Construct Building and Install Equipment, were submitted by the consultant. Review was completed and comments were transmitted to the consultant for incorporation into the final documents.

Plans and specifications at the 85% completion level for Contract III-548, Taraval Substation, Construct Building and Install Equipment, were submitted by the consultant and are being reviewed for final completion.

Plans and specifications at the 85% completion level for Contract III-550, West Portal Substation, Install Equipment, were submitted by the consultant and are being reviewed for final completion.

Amendment No. 2 to the existing Professional Services Agreements, approved by the Public Utilities Commission on May 27, 1975, was approved by UMTA on July 17, 1975. This amendment was certified by the City Controller on September 10, 1975.

Amendment No. 3 to the Existing Professional Services Agreement was negotiated with the consultant. The amendment, which provides for additional services in the review of drawing submittals from the substation equipment manufacturer, I-T-E Imperial Corporation, was approved by the Public Utilities Commission on November 25, 1975, and was transmitted to UMTA for approval on November 18, 1975.

Amendment No. 4 to the existing Professional Services Agreement was negotiated with the consultant. The amendment, which provides for additional design services for Fillmore, Taraval and Bryant Substations, was approved by the Public Utilities Commission on December 9, 1975, and was transmitted to UMTA for approval on December 11, 1975.

Amendments No. 3 and 4 were approved by UMTA on February 4, 1976 and January 21, 1976, respectively, and were certified by the City Controller on February 9, 1976.

The consultant continued design work on Bryant and Richmond Substations (Contracts HH-549 and HH-551).

Building design for the relocated Taraval Substation received Phase I and Phase II approval from the San Francisco Art Commission. Final approval (Phase III) was received for three substations: Fillmore, Randolph and Taraval. This completes Art Commission approval on all six substation buildings.

C) Substation Sites

The use of either of two alternative sites for Taraval Substation was approved by City Planning on July 10, 1975 as conforming to the Master Plan. Appraisals on both sites were completed. An Offer to Sell the preferred alternate site was received from the owner. A resolution authorizing the acquisition of the property from Northern Counties Title Company was adopted by the PUC on September 10, 1975. A resolution approving acquisition of the property was adopted by the Board of Supervisors on October 6, 1975. The deed granting the property to the City and County of San Francisco was recorded on October 29, 1975.

A resolution authorizing the acquisition of an easement from the Pacific Gas and Electric Company for the Randolph Substation was adopted by the PUC on July 29, 1975. On September 2, 1975, the Board of Supervisors adopted a resolution approving the acquisition of the easement. The deed granting the easement to the City and County of San Francisco was recorded on October 3, 1975.

A resolution authorizing acquisition of property from the San Francisco Redevelopment Agency for the Fillmore Substation site was adopted by the Public Utilities Commission on April 27, 1976. On June 7, 1976, the Board of Supervisors adopted a resolution approving the acquisition of the property. The deed conveying the property to the City and County of San Francisco was executed by the San Francisco Redevelopment Agency on June 8, 1976 and was deposited in escrow on June 28, 1976. The deed will be recorded in July 1976.

With the recording of the deed for the Fillmore Substation site, all property acquisition for the six new substation buildings will be completed.

D) Equipment Purchase

The substation equipment manufacturer, I-T-E Imperial Corporation, continued production on the \$5,896,000 purchase contract.

Review of shop drawings submitted by ITE continued. Modification of Contract No. 1, covering changes to Laguna Honda Substation equipment was processed. Modification of Contract No. 2, covering changes to the gap breakers and providing for local warehousing of substation equipment was processed.

Deliveries of equipment commenced. Equipment for the Gap Breaker Stations at Eureka and Forest Hill was delivered to the Contractor, Abbett Electric, at the jobsite (Contract MR-622R) on January 27, 1976, and for the Gap Breaker Stations at Powell and Van Ness was delivered to the Contractor, Amelco Electric, at the jobsite (Contract HH-521) on February 5, 1976. Equipment for the first stage of construction at Downtown Substation was received for installation by the Contractor, De Narde Construction Co., on February 19 and 20, 1976, and equipment for Church Substation was received for installation by the Contractor, De Narde Construction Co., on March 16, 1976 and lowered through the street hatch into the substation (Contract HH-522). The equipment for Civic Center Substation was received and lowered into the station through the roof hatch opening at the U.N. Plaza on June 8, 1976. Additional equipment is being received at the local warehouse for later deliveries to installation contractors. Approximately 60% of the contract equipment is now on hand.

A Service Engineer, assigned by ITE to assist during installation and testing of the new equipment, provided assistance at the four Gap Breaker Stations and at Downtown, Civic Center and Church Substations.

Work commenced on the preparation of plans and specifications for the purchase of additional substation equipment for Stations E, F, J, and N. The recently approved amendment to the Power Improvement Program provides for the acquisition and rehabilitation of these substations, now owned by the Pacific Gas and Electric Company.

4. Control and Communication Project

The Consultant, Systems Control, Inc., had submitted the preliminary report in June 1975. Review was completed on the alternate systems designs presented in the preliminary report. The choice of design was made by Hetch Hetchy. The consultant was directed to proceed with detailed design.

The consultant delivered the Supervisory Control System specifications, at the 30% completion level, for review. In addition, the consultant submitted the design criteria for the subway maintenance telephone system for approval. Review of the submittals and design criteria was completed by Hetch Hetchy. The consultant was notified to proceed with preparation of final plans and specifications.

The 90% completion level submittal is scheduled for August 1976.

5. Feeder Undergrounding

A) United Nations Plaza (DPW Contract 23,476)

All PIP work on this contract was completed in accordance with the contract plans and specifications on September 25, 1975.

B) Judah Street (DPW Contract 23,506)

All PIP work on this contract was completed in accordance with the contract plans and specifications.

C) Ocean Avenue and Phelan Avenue Rechannalization and Track Reconstruction (DPW Contract 23,727)

Plans and specifications for the TIP and PIP portions of DPW Contract 23,727 for Ocean and Phelan Avenues Rechannalization, which will include relocation of trolley poles and the overhead trolley wire system and the undergrounding of feeder cables, along with Muni streetcar track relocation and rerailing, were approved by UMTA on April 7, 1976. The plans and specifications were approved by the State (FAU) on June 4, 1976. The contract was advertised on June 29, 1976 with bids scheduled to be received on August 4, 1976.

D) Fillmore Street, Hayes to Pine Streets, Underground Power Facilities (Contract HH-491)

All work on this contract was completed in accordance with contract plans and specifications.

- E) Ocean Avenue, Junipero Serra Boulevard to Harold Avenue Underground Duct System (Contract HH-502)

All work on this contract was completed in accordance with contract plans and specifications.

- F) 19th Avenue, Randolph and Broad Street - Underground Duct System (Contract HH-519)

All work on this contract was completed in accordance with contract plans and specifications on October 24, 1975.

- G) Church Street - 22nd Street to 30th Street - Underground Duct System (Contract HH-497)

Plans and specifications for constructing manholes and underground duct banks in Church Street between 22nd Street and 30th Street were completed and transmitted to UMTA for approval on November 13, 1975. The plans and specifications were approved by UMTA on December 9, 1975. The contract was awarded on January 13, 1976 to Abbett Electric Corporation, San Francisco, California who submitted the low bid of \$109,590. The contract was certified by the City Controller on February 4, 1976. Construction commenced on February 16, 1976.

- H) Taraval Street and 46th Avenue - 20th Avenue to Vicente Street - Underground Duct System (Contract HH-503)

Plans and specifications for constructing manholes and underground duct banks in Taraval Street and 46th Avenue between 20th Avenue and Vicente Street, were completed and transmitted to UMTA for approval on October 28, 1975. The plans and specifications were approved by UMTA on November 5, 1975. Bids were received on January 15, 1976. The contract was awarded on January 27, 1976 to Peter Kiewit Sons' Company who submitted the low bid of \$246,200. The contract was certified by the City Controller on March 9, 1976. Construction commenced on March 29, 1976.

- I) Sutter Street - Presidio Avenue to Leavenworth Underground Duct System (Contract HH-525)

Plans and specifications for constructing manholes and underground duct banks in Sutter Street between Presidio Avenue and Leavenworth were completed and transmitted to UMTA for approval on September 4, 1975. The plans and specifications were approved by UMTA on September 16, 1975. Bids were received on November 13, 1975. The

contract was awarded on November 25, 1975 to R. Flatland Company, San Mateo, California, who submitted the low bid of \$372,835. The contract was certified by the City Controller on January 8, 1976. Construction commenced on January 26, 1976.

J) McAllister Street - Divisadero to Leavenworth
Underground Duct System (Contract HH-526)

Plans and specifications for constructing manholes and underground duct banks in McAllister Street between Divisadero and Leavenworth were completed and transmitted to UMTA on December 22, 1975. The plans and specifications were approved by UMTA on January 14, 1976. Bids were received on February 2, 1976. The contract was awarded on March 9, 1976 to R. Flatland Company, San Mateo, California who submitted the low bid of \$248,430. The contract was certified by the City Controller on May 27, 1976. Construction commenced on June 1, 1976.

K) Ashbury, Fillmore, Church, 18th and Other Streets
Underground Duct System (Contract HH-527)

Plans and specifications for constructing manholes and underground duct banks in Ashbury, Fillmore, Church, 18th and Other Streets were completed and transmitted to UMTA for approval on March 3, 1976. The plans and specifications were approved by UMTA on March 9, 1976. Bids were received on April 15, 1976. The contract was awarded on April 27, 1976 to The Lowrie Paving Company, South San Francisco, California, who submitted the low bid of \$367,998.50. The contract was certified by the City Controller on June 4, 1976. Construction commenced on June 28, 1976.

L) Ocean Avenue, Persia Avenue and Mission Street - Metro
Center to Russia Street - Underground Duct System
(Contract HH-537)

Plans and specifications for constructing manholes and underground duct banks in Ocean Avenue, Persia Avenue and Mission Street from the new Muni Metro Center to Russia Street were completed and transmitted to UMTA for approval on July 25, 1975. The plans and specifications were approved by UMTA on August 8, 1975. Bids were received on October 2, 1975. The contract was awarded on October 14, 1975 to Venturini Corporation, San Mateo, California, who submitted the low bid of \$127,267. Construction commenced on December 22, 1975. All work on this contract was completed in accordance with contract plans and specifications on June 3, 1976.

- M) Judah Street - 20th to 48th Avenues - Underground Duct System (Contract HH-523)

Work remained suspended on the preparation of plans and specifications for constructing manholes and underground duct banks in Judah Street between 20th and 48th Avenues. Feeder cables will be installed in these duct banks under a later contract. The delay is due to DPW determination of the extent of the Street Improvement and Track Reconstruction work.

- N) Feeder Underground - Folsom and Howard Streets (Contract III-448)

- O) Feeder Undergrounding - Sutter and McAllister Streets (Contract III-540)

- P) Feeder Undergrounding - Irving, Carl, Duboce Fillmore and Church Streets (Contract HH-552)

Work commenced on the preparation of plans and specifications for installation of feeder cables in duct banks constructed under other contracts.

- Q) San Jose Avenue and Broad Street - Metro Center to Plymouth Street - Underground Duct System (Contract HH-558)

- R) Folsom and Howard Streets, Main to 11th Streets Underground Duct System (Contract HH-559)

- S) Haight Street - Stanyan to Gough Streets - Underground Duct System (Contract HH-560)

- T) Fillmore, Jackson, Presidio and Other Streets Underground Duct System (Contract HH-561)

- U) Fulton and McAllister Streets - Stanyan to Divisadero Underground Duct System (Contract HH-562)

- V) Folsom Street - 11th to 16th Streets and 11th Street Market to Bryant - Underground Duct System (Contract HH-563)

- W) Hayes Street - Van Ness Avenue to Stanyan Street Underground Duct System (Contract HH-567)

Work commenced on the preparation of plans and specifications for constructing manholes and underground duct banks. Feeder cables will be installed in these duct banks under later contracts.

X) Other Work

Preliminary engineering and plans and specifications are proceeding for duct lines and feeder undergrounding in accordance with the requirements of the Program.

Y) Manhole Frames and Covers (Second Contract)

Delivery of all manhole frames and covers, totalling 100 sets, was completed on September 15, 1975.

Z) Manhole Frames and Covers (Third Contract)

Contract documents for purchasing an additional 200 sets of manhole frames and covers for use on future Power Improvement Program contracts were prepared and transmitted to UMTA for approval on April 15, 1976, and were approved by UMTA on May 4, 1976. Bids are scheduled to be received by the City Purchaser on July 16, 1976.

6. Overhead Line Work

A) K-Line, Transit Power Facilities, Street Lighting and Related Work (Contract HH-517)

Plans and specifications for trolley pole replacement, overhead trolley wire reconstruction, feeder undergrounding and street lighting on Junipero Serra Boulevard from St. Francis Circle to Ocean Avenue, and for feeder cable installation in duct banks previously constructed under Contracts HH-498 and HH-502 on West Portal Avenue and on Ocean Avenue, were completed and transmitted to UMTA for approval on December 9, 1975. The plans and specifications were approved by UMTA on December 15, 1975. Bids were received on January 29, 1975. The contract was certified by the City Controller on April 17, 1976. Construction commenced on May 24, 1976.

B) K-Line, Ocean Avenue at Route 280 Overpass, Track Reconstruction and Power Facilities (Contract MR-620)

Plans and specifications for trolley overhead work and underground duct lines to be included in Contract MR-620, "K" Line, Ocean Avenue at Route 280 Overpass, Track Reconstruction and Power Facilities, were completed and transmitted to TIP on November 20, 1975. The plans and specifications were completed by TIP and transmitted to UMTA for approval on January 23, 1976. The plans and specifications were approved by UMTA on February 18, 1976. Bids were received on March 12, 1976. The low bid in the amount of \$328,820 includes an amount of

\$64,526 for the Power Improvement Program (PIP) portion of the work. The contract was awarded to Homer J. Olsen, Inc., Union City, California on April 9, 1976. The contract was certified by the City Controller on June 16, 1976. Construction work commenced on June 28, 1976.

C) Transit Preferential Street Program: Mission Street and Fourth Street, Muni Passenger Platforms and Muni Power Facilities (DPW Contract 23,834)

Plans and specifications for the PIP portion of Department of Public Works (DPW) Contract No. 23,834, Transit Preferential Street Program: Mission Street, Beale to South Van Ness Avenue; and Fourth Street, Market to Townsend; which include the relocation of trolley coach overhead facilities, were transmitted to UMTA for approval on October 14, 1975. The Department of Public Works transmitted the final contract plans and specifications were approved by UMTA on April 7, 1976 and the State (FAU) on April 29, 1976. Advertising of the contract is awaiting scheduling by the Department of Public Works.

7. Miscellaneous

- A) Coordination meetings of the joint staffs of Transit Improvement Program and the Power Improvement Program were held.
- B) Coordination meetings were held between Hetch Hetchy staff and the consultants on the electrification, substation and control and communication projects.

BUREAU OF LIGHT, HEAT AND POWER

STREET LIGHTING

General

The lighting of public streets within the City of San Francisco is provided by facilities which are, on a City-wide basis, 43.5% owned by the City; 54.7% owned by the Pacific Gas and Electric Company; and a small percentage, 1.8%, jointly owned. In the underground areas, where the economic advantage of City ownership is greatest, 81.3% of the lights are City-owned. Five years ago, the corresponding figure was 74.4%.

In fiscal year 1933-34, the cost for street lighting was \$1.25 per capita; last year, with approximately thirty times as much light on the streets and public thoroughfares, the cost per capita was approximately \$1.85.

Maintenance and repair of City-owned installations was performed under two contracts. One provided for group replacement of lamps in accordance with schedules developed by the Bureau. A second contract covered work required for repair of damaged and defective equipment, painting and miscellaneous maintenance.

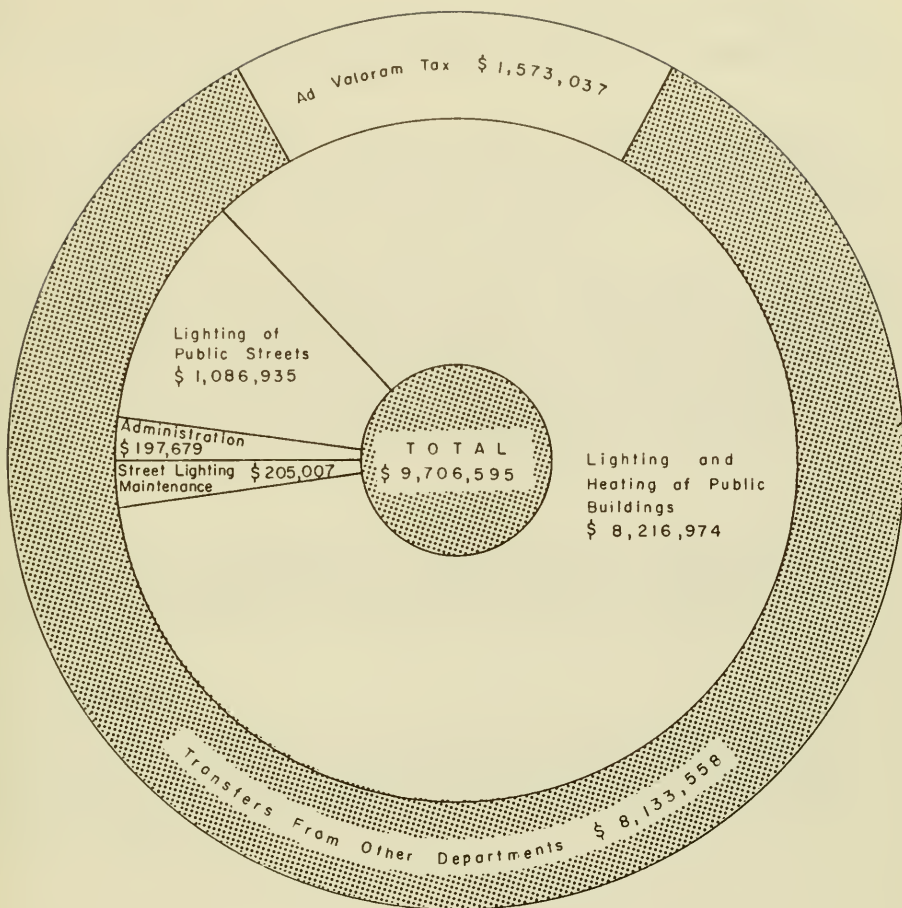
Under contract, the Pacific Gas and Electric Company furnished street lighting service as directed, including the furnishing, maintenance and operation of Company-owned facilities. Certain services were provided also for City-owned facilities, including switching and control, replacement of individual lamps and globes, and emergency work required during other than normal working hours.

Electric energy for all City and Company-owned streetlight operation was supplied by the Hetch Hetchy power system.

Engineering

The Bureau reviews, recommends changes, approvals or rejections of, and correlates all street lighting installations, including that done by the Department of Public Works, the Pacific Gas and Electric Company, the State of California, subdividers, etc.

During the fiscal year 1975-76, 19 street lighting contracts, involving a total of 819 new streetlights, were approved by the Public Utilities Commission. Plans were submitted only after careful checking to determine that illumination will exceed the minimum requirements established by the American National Standards Institute; and that all materials used, and manner of installation, meet with the applicable local, state and federal rules, regulations and statutes governing the installation of electrical works.



BUREAU OF LIGHT, HEAT & POWER

REVENUES AND EXPENDITURES

FISCAL YEAR 1975-1976

Operation and Maintenance

As of June 30, 1976, a total of 37,378 City-owned and Company-owned streetlights were in service to the public streets, parks, viaducts, overcrossings, tunnels and underpasses. A summary of the number and type of units in service at the end of the fiscal year is shown in Appendix Table.

A total of \$1,326,226 was expended for operation, maintenance, and repair of the street lighting system. Of the total cost, \$12,649 was paid by the State for its share of the operation and maintenance of street lighting at intersections on City streets, which are part of the State Highway system.

During the fiscal year, there were 114 accidents involving damage to City-owned street lighting property. Investigation was made, as soon as possible, to remove hazards to the public and obstructions to traffic. Total cost of repairs to damaged City-owned street lighting property was \$73,125. Every effort was made to secure reimbursement for damages incurred from responsible parties. Previous experience indicates that approximately three-fourths of the repair costs will be recovered.

Complaints

During the year, 48 complaints requiring field investigation were received and acted upon. These complaints concerned inadequate illumination, objectionable glare in windows, and requests for temporary and permanent relocation of street lighting poles.

Improvements

During the fiscal year 1975-76, a total of 868 new City-owned streetlights were placed in service at a cost of \$724,798. Improvements were financed by State Gasoline Tax and the 1964 and 1972 Street Lighting Bond Issues as indicated in Appendix Tables 16 and 17.

UTILITY SERVICES TO MUNICIPAL DEPARTMENTS

General

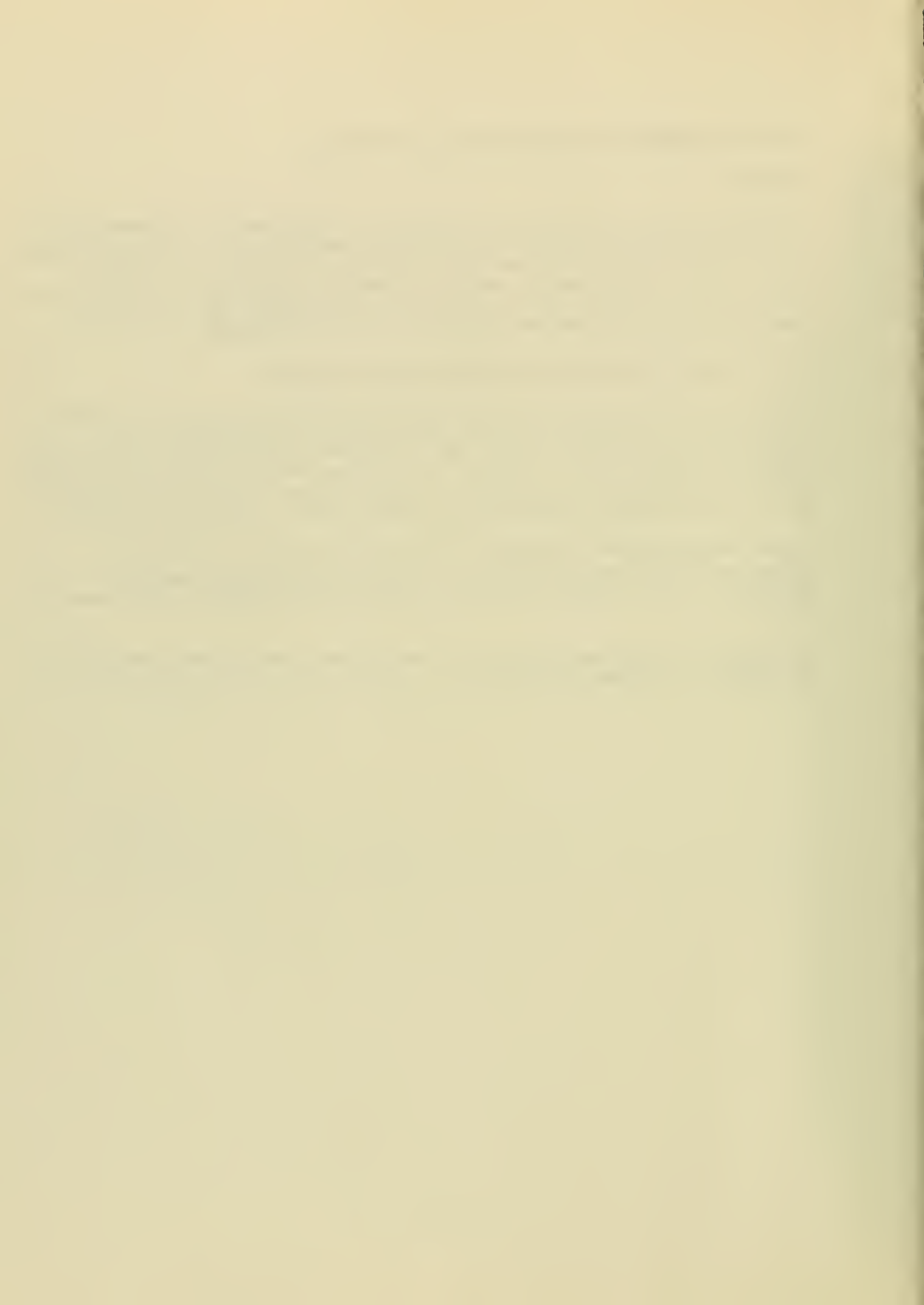
Electric energy supplied to municipal departments is generated on the Hetch Hetchy power system and delivered to various service points by transmission and distribution facilities of Pacific Gas and Electric Company under a wheeling contract. Natural gas supplied to municipal departments is furnished by the Pacific Gas and Electric Company under a service contract.

Municipal Consumption of Electricity and Gas

During the fiscal year, 486,936,786 kilowatthours of electrical energy were consumed through 1,054 municipal accounts at an expenditure of \$6,077,738. Of the above, 147,463,469 kilowatt-hours of energy were supplied to the San Francisco International Airport for resale to tenants. Natural gas consumption was 17,787,179 therms through 556 accounts at a cost of \$2,691,890.

There were several increases in gas rates last year which increased the cost to municipal accounts by approximately \$805,652. The average cost per therm increased by approximately 42%.

A summary of consumption and expenditures for these commodities is shown in Tables 12 and 13.



A P P E N D I X

TABLE 1

HETCH HETCHY WATER AND POWER*

COMPARISON OF BUDGETED AND ACTUAL EXPENDITURES (INCLUDING ENCUMBRANCES)

FISCAL YEAR 1975-76

OE	DESCRIPTION	BUDGET	ACTUAL	-UNDER, OVER
110	Permanent Salaries	\$ 779,469	\$ 649,653	\$ -129,816
111	Overtime	15,750	15,400	-300
112	Holiday Pay	4,070	2,662	-1,408
120	Temporary Salaries	53,180	49,102	-4,078
130	Wages	1,789,623	1,427,802	-361,821
139	Permanent Salaries - Gardeners	58,107	53,393	-4,714
200	Contractual Services	79,090	72,226	18,136
216	Maint. and Repair of Auto Equipment	12,000	6,118	-5,882
231-1	Purchase of Power for Resale	4,284,000	3,903,720	-380,280
231-2	Service Charge for Transm. and Dist.	2,500,000	2,436,435	-63,565
251	Subsistence of Employees	10,000	3,464	-6,536
300	Materials and Supplies	140,875	157,519	16,644
640	Water Rights and Damage Claims	12,000	- 0 -	-12,000
641	Hydrography	45,800	45,713	-87
801	Accident Compensation	24,750	42,438	17,688
804	Claims	500	163	-337
812	Fidelity Insurance	72	82	10
813	Automobile Insurance	11,130	11,130	- 0 -
814	Fire Insurance	23,064	23,064	- 0 -
815	Miscellaneous Insurance	39,498	39,498	- 0 -
853	Assessments	45,000	17,077	-27,923
854	Membership Dues	5,312	5,744	432
855	Fee to U.S. Gov't. - Raker Act	30,000	30,000	- 0 -
856	Maint. of Roads - Raker Act	15,000	15,000	- 0 -
860	Retirement Allowances	550,401	367,277	-183,124
862	Social Security	114,902	119,989	5,087
865	Health Service System	58,916	33,410	-25,506
870	Taxes	525,396	525,312	-84
880	Rental - Transm. Lines and Offices	136,400	111,900	-24,500
900	Services of Other Departments	864,121	864,121	- 0 -
	TOTAL OPERATION AND MAINTENANCE	\$12,228,426	\$11,054,412	\$ -1,174,014
400	Equipment	59,634	59,628	-6
476	Library and Reference Books	800	- 0 -	-800
500	Additions and Betterments	24,000	24,000	- 0 -
700	Reconstruction and Replacement	197,000	197,000	- 0 -
830	Bond Interest and Redemption	8,840,856	8,840,856	- 0 -
	TOTALS	<u>\$21,350,716</u>	<u>\$20,175,896</u>	<u>\$ -1,174,820</u>

* Does not include Transit Power Division - Table 4 or Bureau of Light, Heat and Power - Table 11.

TABLE 2

SUMMARY OF TAXES

FISCAL YEAR 1975-76

HETCH HETCHY PROJECT

<u>Tax Levying Bodies</u>	<u>Assessed Values</u>	<u>Total Amount of Taxes</u>
Alameda County	\$ 2,350.00	\$ 284.62
San Joaquin County	42,250.00	4,533.68
San Mateo County	3,610.00	322.10
Stanislaus County	116,170.00	11,442.62
Tuolumne County	5,706,865.00	507,957.24
Banta-Carbona Irrigation Dist.	3,642.28	156.62
Oakdale Irrigation Dist.	25,897.00	544.94
West Stanislaus Irrigation Dist.	4,250.00	153.00
	<u>\$ 5,905,034.28</u>	<u>\$ 525,394.82</u>

TABLE 3

TRANSIT POWER DIVISION

MOTIVE POWER SECTION - SUBSTATIONS

Substation	Type (a)	Date Installed	No. of Units	KW Size	Fiscal Year 1975-76	
					Max. Loan in KW	KWH Converted to 600 v d-c
Bryant	M-G	1910	3	1500	2254	7,650,600
	M-G	1910	(b) 2	1500	0	0
Turk	M-G	1910	3	1500	4494	8,178,550
	M-G	1910	(b) 2	1500	0	0
Downtown	SC	1921	2	2000	3460	7,569,200
	SC	1924	1	3000		
Eighth Avenue	SC	(c) 1921	1	1500	1395	2,944,800
	SC	(c) 1921	(b) 1	1500	0	0
	SC	1924	1	2000		
	MAR	1951	1	2000	2325	5,602,000
Outer Mission	MAR	1953	1	750	860	2,565,000
Geneva	M-G	1910	3	1500	1370	17,500
						<hr/>
						34,527,650

Notes: (a) Type of Conversion Equipment:

M-G = Motor-Generator

SC = Synchronous Converter

MAR = Mercury Arc Rectifier

(b) Indicates units that are not serviceable. Units have not been repaired because of the high cost and because they are not needed to carry the present load. Also, it is planned to replace the conversion equipment with modern silicon rectifiers in the near future.

(c) Units were originally installed at Washington and Mason in 1914 and were moved to Eighth Avenue in 1921.

TABLE 4

HETCH HETCHY WATER AND POWER

TRANSIT POWER DIVISION

COMPARISON OF BUDGETED AND ACTUAL EXPENDITURES
(INCLUDING ENCUMBRANCES)

FISCAL YEAR 1975-76

<u>OE</u>	<u>DESCRIPTION</u>	<u>BUDGET</u>	<u>ACTUAL</u>	<u>-UNDER, OVER</u>
110-1	Permanent Salaries	\$ 75,529	\$ 36,532	\$ -38,997
130-1	Wages	1,230,128	973,844	-256,284
200-1	Contractual Services	30,000	2,055	-27,945
300-1	Materials and Supplies	56,000	14,973	-41,027
801-1	Accident Compensation	35,250	18,571	-16,679
860-1	Retirement Allowance	247,147	160,723	-86,424
862-1	Social Security	50,723	52,508	1,785
865-1	Health Service System	10,159	14,620	4,461
900-1	Services of Other Departments	175,258	175,258	- 0 -
	TOTAL OPERATION AND MAINT.	\$ 1,910,194	\$1,449,084	\$ -461,110
700	Reconstruction and Replacement	2,595,000	2,595,000	- 0 -
	TOTAL	\$ 4,505,194	\$4,044,084	\$ -461,110

TABLE 5

HETCH HETCHY WATER AND POWER

SUMMARY OF RECEIPTS AND EXPENDITURES

FISCAL YEAR 1975-76

<u>RECEIPTS</u>	<u>BUDGET</u>	<u>ACTUAL</u>	<u>-UNDER, OVER</u>
Revenue from Sale of Electrical Energy	\$ 15,883,000	\$ 19,693,525	\$ 3,810,525
Revenue from Sale of Water and Standby Charge, SFWD	6,500,000	6,500,000	- 0 -
Other Revenue	<u>100,000</u>	<u>187,307</u>	<u>87,307</u>
	\$ 22,483,000	\$ 26,380,832	\$ 3,897,832
 <u>EXPENDITURES</u>			
Total Expenditures	<u>\$ 25,855,910</u>	<u>\$ 24,219,980</u>	<u>\$-1,635,930</u>

TABLE 6
HETCH HETCHY WATER SUPPLY

PRECIPITATION, RUNOFF, STORAGE AND DELIVERY
AS OF JUNE 30 BY FISCAL YEARS

<u>SEASON PRECIPITATION (INCHES)</u>	<u>Normal</u>	<u>1971-72</u>	<u>1972-73</u>	<u>1973-74</u>	<u>1974-75</u>	<u>1975-76</u>
Hetch Hetchy	34.27	24.84	35.97	38.46	39.15	21.80
Lake Lloyd	46.92	32.77	46.03	57.45	47.86	24.91
Approx. Percent of Normal	100%	71%	102%	112%	107%	58%

WATERSHED RUNOFF (ACRE-FT.) (a)

Hetch Hetchy	726,098	584,400	780,799	871,240	769,239	376,347
Lake Lloyd)	424,759	331,800	444,358	533,923	450,131	229,041
Lake Eleanor)						
Total	<u>1,150,857</u>	<u>916,200</u>	<u>1,225,157</u>	<u>1,405,163</u>	<u>1,219,370</u>	<u>605,388</u>
Approx. Percent of Normal		79%	106%	121%	105%	52%

No Spill
Capacity

RESERVOIR STORAGE (ACRE-FT.) (a)

Hetch Hetchy	360,360	324,530	362,736	360,163	327,963	201,576
Lake Lloyd	268,800	151,653	217,872	268,284	239,909	154,439
Lake Eleanor	27,100	2,110	27,016	26,726	26,823	2,563
Total	<u>656,260</u>	<u>478,293</u>	<u>607,624</u>	<u>655,173</u>	<u>594,695</u>	<u>358,578</u>

DELIVERY TO SFWD (ACRE-FT.) (a) (b)

Average per day	702	585	532	675	588
Maximum per day	856	856	850	925	934
Total for fiscal year	<u>257,046</u>	<u>213,684</u>	<u>193,518</u>	<u>246,514</u>	<u>215,726</u>

Total since operation of Hetch Hetchy Aqueduct began in 1934: 4,800,026 acre-feet

NOTES: (a) One acre-foot equals 325,900 gallons or approximately 1/3 million gallons.
(b) Includes delivery to Livermore site, U.S. Atomic Energy Commission.

TABLE 7
HETCH HETCHY POWER SYSTEM

ELECTRIC ENERGY GENERATED, PURCHASED, AND DISTRIBUTED
FISCAL YEAR 1975-76

<u>PLANT DATA</u>	<u>Nameplate Rating</u> <u>(Kilowatts)</u>	<u>Capability</u> <u>(Kilowatts)</u>	<u>Annual Plant</u> <u>Factor - %</u>
Moccasin Powerhouse	90,000	104,000	50.6
Dion R. Holm Powerhouse	135,000	150,000	50.0
Robert C. Kirkwood Powerhouse	<u>67,500</u>	<u>85,000</u>	70.2
Total	292,500	339,000	
<u>ENERGY GENERATED AND PURCHASED (KILOWATT-HOURS)</u>			
<u>Gross Generation</u>			
Moccasin Powerhouse		460,560,000	
Dion R. Holm Powerhouse		657,219,000	
Robert C. Kirkwood Powerhouse		<u>522,892,000</u>	1,640,671,000
<u>Station Service</u>			
Moccasin Powerhouse		841,700	
Dion R. Holm Powerhouse		1,238,750	
Robert C. Kirkwood Powerhouse		<u>772,150</u>	<u>2,852,600</u>
<u>Net Generation</u>			1,637,818,400
<u>Supplementary Energy</u>			
"Bank" Withdrawal*		36,545,220	
Purchase (PGandE)		<u>247,922,311</u>	<u>284,467,531</u>
<u>Total</u>			<u>1,922,285,931</u>
<u>ENERGY DISTRIBUTED (KILOWATT-HOURS)</u>			
<u>Sales</u>			
Municipal Accounts		490,203,242	
Modesto Irrigation District		865,104,000	
Turlock Irrigation District		248,817,883	
Kaiser Cement and Gypsum Corp.		78,351,659	
Kaiser Aluminum and Chemical Corp.		11,280,000	
Norris Industries, Inc.		7,167,744	
Lockheed Missiles and Space Co. Inc.		80,177,458	
General Motors Corporation		28,837,778	
I B M Corporation		25,761,600	
Liquid Air, Inc.		12,547,200	
Miscellaneous Customers		<u>920,851</u>	1,849,169,415
<u>Non-Revenue</u>			
Project Use		3,277,963	
"Bank" Deposit*		<u>2,773,513</u>	6,051,476
<u>Losses</u>			
Hetch Hetchy System		33,816,359	
PGandE System (Municipal Accounts)		<u>33,248,681</u>	<u>67,065,040</u>
<u>Total</u>			<u>1,922,285,931</u>

* In accordance with letter-agreement between City and PGandE dated 6/24/75

TABLE 8

HETCH HETCHY POWER SYSTEM

COMPARATIVE ELECTRIC ENERGY SALES TO CUSTOMERS
FISCAL YEARS 1974-75 AND 1975-76
 (Nearest 100,000 Kilowatthours)

<u>CUSTOMER</u>	<u>1974-75</u>	<u>1975-76</u>
Municipal Accounts		
International Airport	189,900,000	189,200,000
Municipal Railway	64,800,000	56,900,000
Public Works	26,600,000	26,800,000
Street Lighting	45,800,000	46,400,000
Unified School District	38,300,000	39,700,000
Water Department	44,000,000	48,400,000
Other City Departments	71,900,000	82,800,000
Modesto Irrigation District	734,900,000	865,100,000
Turlock Irrigation District	219,100,000	248,800,000
Kaiser Cement and Gypsum Corp.	143,700,000	78,400,000
Kaiser Aluminum and Chemical Corp.	28,100,000	11,300,000
Norris Industries, Inc.	21,700,000	7,200,000
Lockheed Missiles & Space Co., Inc.	209,300,000	80,200,000
General Motors Corporation	76,000,000	28,800,000
I B M Corporation	82,100,000	25,800,000
Liquid Air, Inc.	28,100,000	12,500,000
Miscellaneous Customers	800,000	900,000
	<u>2,025,100,000</u>	<u>1,849,200,000</u>
TOTAL		

TABLE 9

HETCH HETCHY POWER SYSTEM

COMPARATIVE GROSS REVENUE RECEIVED FROM SALE OF ELECTRIC ENERGY
FISCAL YEARS 1974-75 AND 1975-76
 (Nearest \$1,000)

<u>CUSTOMER</u>	<u>1974-75</u>	<u>1975-76</u>
Municipal Accounts		
International Airport	\$ 1,588,000	\$ 2,542,000
Municipal Railway	649,000	649,000
Public Works	333,000	330,000
Street Lighting	485,000	517,000
Unified School District	567,000	553,000
Water Department	395,000	476,000
Other City Departments	912,000	1,011,000
Modesto Irrigation District	4,289,000	7,457,000
Turlock Irrigation District	1,483,000	2,283,000
Kaiser Cement and Gypsum Corp.	1,927,000	1,318,000
Kaiser Aluminum and Chemical Corp.	418,000	220,000
Norris Industries, Inc.	227,000	164,000
Lockheed Missiles & Space Co., Inc.	2,772,000	1,454,000
General Motors Corporation	1,054,000	572,000
I B M Corporation	1,122,000	478,000
Liquid Air, Inc.	373,000	190,000
Miscellaneous Customers	9,000	10,000
	<hr/>	<hr/>
TOTAL	\$ 18,603,000	\$ 20,224,000
	<hr/> <hr/>	<hr/> <hr/>

TABLE 10

HETCH HETCHY POWER SYSTEM

ELECTRIC ENERGY GENERATED, PURCHASED, AND DISTRIBUTED BY FISCAL YEARS --- KILOWATT-HOURS

NET GENERATION	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Moccasin Powerhouse	531,070,800	533,978,200	542,886,200	554,418,600	539,122,000	459,718,300
Dion R. Holm Powerhouse	892,230,400	808,515,430	653,141,570	818,867,290	875,047,560	655,980,250
Robert C. Kirkwood Powerhouse	630,874,100	614,151,930	601,147,890	616,788,400	640,097,630	522,119,850
Subtotal	2,054,175,300	1,956,645,560	1,797,175,660	1,990,074,290	2,054,267,190	1,637,818,400
SUPPLEMENTAL ENERGY						
"Bank" Withdrawal*	133,964,745	46,360,466	0	36,435,281	123,458,969	36,545,220
Purchase (PGandE)	46,097,953	108,734,434	351,288,448	44,401,773	0	247,922,311
Subtotal	180,062,698	155,094,900	351,288,448	80,837,054	123,458,969	284,467,531
TOTAL	2,234,237,998	2,111,740,460	2,148,464,108	2,070,911,344	2,177,726,159	1,922,285,931
DISTRIBUTION						
Sales						
Municipal Accounts	458,127,155	478,105,789	508,259,909	482,482,697	481,275,895	490,203,242
Modesto Irrigation Dist.	728,371,000	796,740,000	858,816,000	787,392,000	734,880,000	865,104,000
Turlock Irrigation Dist.	321,456,000	360,619,200	421,484,000	302,784,000	219,120,000	248,817,883
Kaiser Cement & Gypsum	152,736,000	152,127,205	145,368,000	156,720,000	143,688,000	78,351,659
Kaiser Aluminum & Chemical	39,549,000	33,996,000	31,521,600	31,320,000	28,137,600	11,280,000
Norris Industries, Inc.	24,033,485	17,664,768	22,325,760	22,502,016	21,695,155	7,167,744
Hercules, Inc.	94,662,000	57,906,000	---	---	---	---
California Ammonia Co.	104,280,480	80,876,760	---	---	---	---
Air Products & Chemicals	32,653,056	---	---	---	---	---
Valley Nitrogen Producers	108,631,560	---	---	---	---	---
Lockheed Missiles	---	---	---	---	---	---
General Motors	---	---	---	---	---	---
IBM Corporation	---	---	---	---	---	---
Liquid Air, Inc.	---	---	---	---	---	---
Miscellaneous Customers	745,614	759,065	847,858	733,633	809,002	920,851
Non-Revenue						
Project Use	4,101,136	4,287,512	4,003,796	3,266,691	3,264,541	3,277,963
"Bank Deposit"*	47,826,652	9,756,928	28,985,698	130,908,552	33,771,707	2,773,513
Losses	117,064,260	118,901,233	126,851,487	113,244,955	115,615,447	67,065,040
TOTAL	2,234,237,998	2,111,740,460	2,148,464,108	2,070,911,344	2,177,726,159	1,922,285,931

* In accordance with letter - agreement between City and PGandE dated June 24, 1975.

TABLE 11
BUREAU OF LIGHT, HEAT AND POWER

COMPARISON OF BUDGETED AND ACTUAL EXPENSITURES AND RECEIPTS
(INCLUDING ENVUMBRANCES)

FISCAL YEAR 1975-76

<u>OF</u>	<u>DESCRIPTION</u>	<u>BUDGET</u>	<u>ACTUAL</u>	<u>-UNDER +OVER</u>
<u>EXPENDITURES</u>				
110	Permanent Salaries	\$ 175,980	\$ 158,116	\$ -17,864
111	Overtime	550	261	-289
112	Holiday Pay	400	261	-139
200	Contractual Services	1,250	1,259	+9
231	Lighting and Heating of Public Buildings - General	2,113,223	2,076,281	-36,942
231-1	Lighting and Heating of Public Buildings - Special Fund	6,086,322	6,140,693	+54,371
231-2	Lighting of Public Streets - Pacific Gas and Electric Co.	577,000	581,186	+4,186
231-3	Lighting of Public Streets - Hetch Hetchy	493,000	504,549	+11,549
231-4	Lighting of Public Streets - Calif. Division of Highways	1,200	1,200	-0-
300	Materials and Supplies	460	490	+30
813	Auto Insurance	257	222	-35
860	Retirement Allowance	28,732	25,761	-2,971
862	Social Security	8,190	5,792	-2,398
865	Health Service System	5,793	3,884	-1,909
954	EDP - PUC Data Processing	1,633	1,633	-0-
TOTAL		<u>\$9,493,990</u>	<u>\$9,501,588</u>	<u>\$ +7,598</u>
<u>RECEIPTS</u>				
	Interfund Receipts*	\$7,641,616	\$7,928,551	\$ +286,935
	Ad Valorem Taxes	<u>1,852,374</u>	<u>1,573,037</u>	<u>-279,337</u>
TOTAL		<u>\$9,493,990</u>	<u>\$9,501,588</u>	<u>\$ -7,598</u>

WORK ORDER APPROPRIATIONS FROM ROAD FUND

<u>DESCRIPTION</u>	<u>TOTAL FUNDS</u>	<u>EXPENDITURE</u>	<u>-UNDER +OVER</u>
Maintenance and Repair of Street Lighting Installation	\$ 205,000	\$ 205,007	\$ +7

* Transfers from other Departments.

TABLE 12
BUREAU OF LIGHT, HEAT AND POWER
EXPENDITURE FOR ELECTRICITY FOR MUNICIPAL PURPOSES
FISCAL YEAR 1975 - 1976

DEPARTMENT	NO. OF ACCOUNTS	CONSUMPTION KILOWATT-HOUR	EXPENDITURES
Art Museum	1	1,095,360	12,696
Auditorium and Brooks Hall	1	4,539,200	54,415
Child Care Centers	12	239,694	4,908
City Demonstration Agency (a)	1	77,680	1,202
City Planning	1	81,460	1,384
De Young Museum	1	3,206,400	33,641
Disaster Corp.	1	78	1,244
Electricity	5	446,070	7,106
Farmer's Market	1	19,696	421
Fire	59	3,036,107	53,699
Hassler Health Home	1	201,000	3,000
Health	37	26,742,105	257,322
Hetch Hetchy	6	144,124	2,926
Hidden Valley Ranch	1	938,880	11,139
International Airport (b)	18	189,260,331	2,542,054
Junior College District	26	7,694,518	88,100
Juvenile Hall	3	1,414,463	15,601
Legion of Honor	1	550,800	7,019
Library	31	2,727,443	40,796
Log Cabin Ranch	13	358,219	7,111
Municipal Railway	73	56,869,769	648,924
Parking Authority	18	193,116	4,032
Police	15	871,030	14,877
Public Buildings	11	14,829,365	149,091
Public Works	106	26,468,126	324,721
Purchasing	5	481,068	6,942
Real Estate	4	253,960	4,033
Recreation and Park	202	10,305,848	163,473
Recreation and Park - Candlestick Park	3	1,993,676	53,160
Recreation and Park - Yatch Harbor	32	1,314,476	24,276
Sheriff	3	1,636,280	16,706
Social Services	5	815,248	10,924
Street Lighting Operations (.003)	1	46,383,311	504,549
Unified School District	222	31,985,522	464,706
War Memorial	1	1,377,840	17,200
Water	128	48,384,523	476,269
TOTAL MUNICIPAL DEPARTMENTS	1,050	486,936,786	6,029,667
Academy of Sciences	2	2,951,060	30,174
State of California: Street Lighting	1	(c)	12,649
Traffic Devices	1	315,396	5,248
GRAND TOTAL FROM HETCH HETCHY	1,054	490,203,242	6,077,738

Notes: (a) New Account, previously charged in Real Estate Department
 (b) Including 147,463,469 KWH resold at commercial rates for \$2,197,598 to Airport tenants
 (c) Included under Street Lighting Operations.

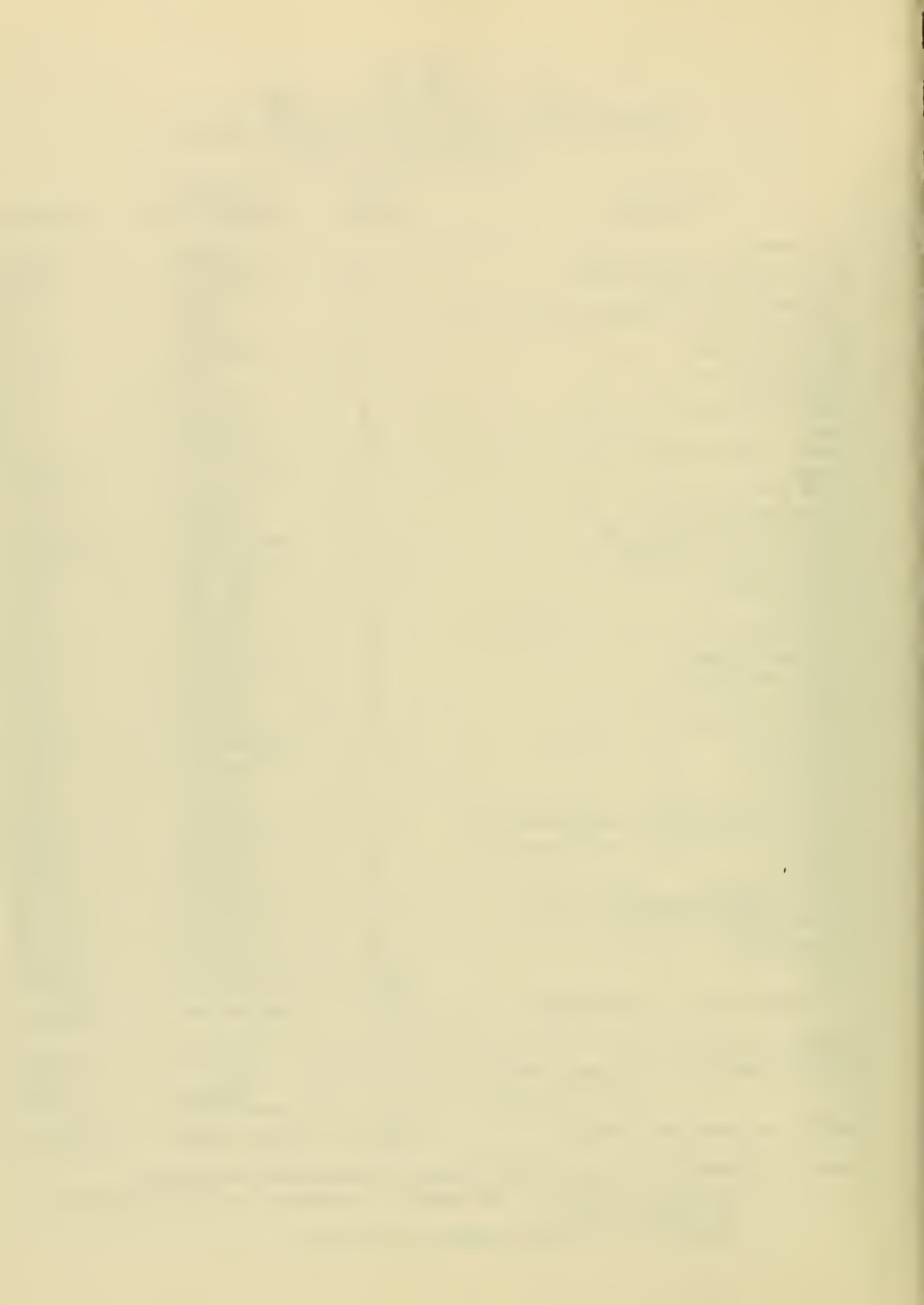


TABLE 13
BUREAU OF LIGHT, HEAT AND POWER
EXPENDITURE FOR GAS FOR MUNICIPAL PURPOSES
FISCAL YEAR 1975 - 1976

NATURAL GAS

<u>DEPARTMENT</u>	<u>NO. OF ACCOUNTS</u>	<u>CONSUMPTION THERMS</u>	<u>EXPENDITURES</u>
Auditorium and Brooks Hall	2	661	114
Child Care Centers	11	30,763	4,702
City Demonstration Agency (a)	1	4,584	727
City Planning	1	5,265	806
De Young Museum	1	282,182	42,911
Electricity	2	48,090	7,275
Farmer's Market	1	486	81
Fire	54	582,633	87,564
Hassler Health Home	3	32,998	4,965
Health	31	5,411,853	794,270
Hetch Hetchy	2	1,947	328
International Airport	5	1,500,388	217,420
Junior College District	17	899,104	135,658
Juvenile Hall	4	444,456	66,941
Legion of Honor	1	56,329	8,545
Library	28	113,480	17,432
Municipal Railway	13	264,921	37,718
Police	11	45,807	7,017
Public Buildings	6	1,175,537	169,329
Public Works	15	264,324	44,624
Purchasing	3	52,565	7,827
Real Estate	2	8,048	1,192
Recreation and Park	106	1,300,528	196,975
Recreation and Park - Candlestick Park	1	109,643	16,485
Registrar of Voters	1	5,837	898
Sheriff	3	473,745	68,002
Single Men's Rehabilitation Center	1	37,233	5,571
Social Services	4	55,171	8,361
Unified School District	213	4,443,213	677,284
War Memorial	3	244,240	37,171
Water	10	155,472	23,697
TOTAL MUNICIPAL DEPARTMENTS	556	17,787,179	2,691,890

Note: (a) New Account, previously charged in Real Estate Department.

TABLE 11
BUREAU OF LIGHT, HEAT AND POWER
STREET LIGHTS IN SERVICE
JUNE 30, 1976

<u>SIZE & TYPE OF LAMP</u>	<u>COMPANY- OWNED</u>	<u>JOINTLY- OWNED</u>	<u>CITY- OWNED</u>	<u>TOTAL</u>
<u>UNDERGROUND CONNECTION</u>				
<u>High Voltage Series Circuit</u>				
1,000-Lumen Incandescent	---	22	---	22
2,500 " "	245	24	73	342
4,000 " "	997	127	1,142	2,266
6,000 " "	577	441	3,034	4,052
10,000 " "	443	24	547	1,014
400-Watt Mercury Vapor	6	43	236	285
175 " "	---	---	10	10
250 " "	2	---	79	81
<u>Low Voltage Multiple Circuit</u>				
1,000-Lumen Incandescent	---	---	70	70
2,500 " "	10	4	58	72
4,000 " "	177	2	104	283
6,000 " "	38	5	85	128
10,000 " "	10	---	14	24
5,500 " Fluorescent	---	---	38	38
23,000 " "	38	---	4	42
100-Watt Mercury Vapor	---	---	112	112
175 " "	44	---	3,521	3,565
250 " "	37	---	1,338	1,375
400 " "	304	---	4,604	4,908
700 " "	---	---	368	368
1,000 " "	---	---	101	101
250-Watt Sodium Vapor	---	---	10	10
400 " "	---	---	658	658
<u>OVERHEAD CONNECTION</u>				
<u>High Voltage Series Circuit</u>				
2,500-Lumen Incandescent	1	---	---	1
4,000 " "	28	---	42	70
<u>Low Voltage Multiple Circuit</u>				
2,500-Lumen Incandescent	2	---	---	2
4,000 " "	52	---	7	59
6,000 " "	8	---	---	8
175-Watt Mercury Vapor	14,705	---	2	14,707
250 " "	1,907	---	---	1,907
400 " "	798	---	---	798
<u>TOTAL, JUNE 30, 1976</u>	<u>20,429</u>	<u>692</u>	<u>16,257</u>	<u>37,378</u>
	54.7%	1.8%	43.5%	100%
<u>TOTAL, JUNE 30, 1975</u>	<u>20,599</u>	<u>700</u>	<u>15,762</u>	<u>37,061</u>
<u>NET CHANGE DURING THE YEAR</u>	<u>-170</u>	<u>-8</u>	<u>+495</u>	<u>+317</u>

TABLE 15
BUREAU OF LIGHT, HEAT AND POWER
EXPENDITURES FOR OPERATION AND MAINTENANCE OF STREET LIGHTING
FISCAL YEAR 1975 - 76

CONTRACTUAL SERVICE

P. G. & E. Company

Company-owned facilities (a)	824,140		
Jointly-owned facilities (a)	34,623		
City-owned facilities (b)	126,819	985,582	
Less deduction for energy component		404,395	581,187
Emergency service to City-owned facilities			6,600

Lease-Lite Corporation

Group lamp replacement - City-owned facilities			57,033
--	--	--	--------

Lease-Lite Corporation

Maintenance and repair - City-owned facilities			
Routine maintenance		47,308	
Repair of damage caused by accidents (c)		42,605	
Repair of damage caused by equipment failure		41,810	
Repair of damage caused by vandals		2,679	134,402

MATERIAL AND SUPPLIES (FURNISHED BY CITY)

Damage caused by accidents (c)	30,520		
Damage caused by equipment failure	10,814		
Damage caused by vandals	1,159		42,493

ELECTRIC ENERGY (HETCH HETCHY)

46,383,311 KWH at \$0.02055/KWH less 45.5% discount			519,481
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TOTAL EXPENDITURE			1,341,196
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LESS AMOUNT PAID TO HETCH HETCHY FROM:

Gas Tax Funds for State Highway Routes	12,649		
Recreation and Park Department for off-street lighting	2,281		14,930

TOTAL NET EXPENDITURE			<u>1,326,266</u>
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AVERAGE OPERATING COST

Based on number of lights in service June 30, 1976, average total cost of operation, maintenance and repair per light per year:			<u>35.39</u>
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- NOTES: (a) Includes maintenance, repair, fixed charges and electric energy for Company-owned facilities.
- (b) Includes replacement of individual lamp and broken glassware, service and switching charges, and electric energy.
- (c) When responsible party is known, claim is filed for recovery of cost.

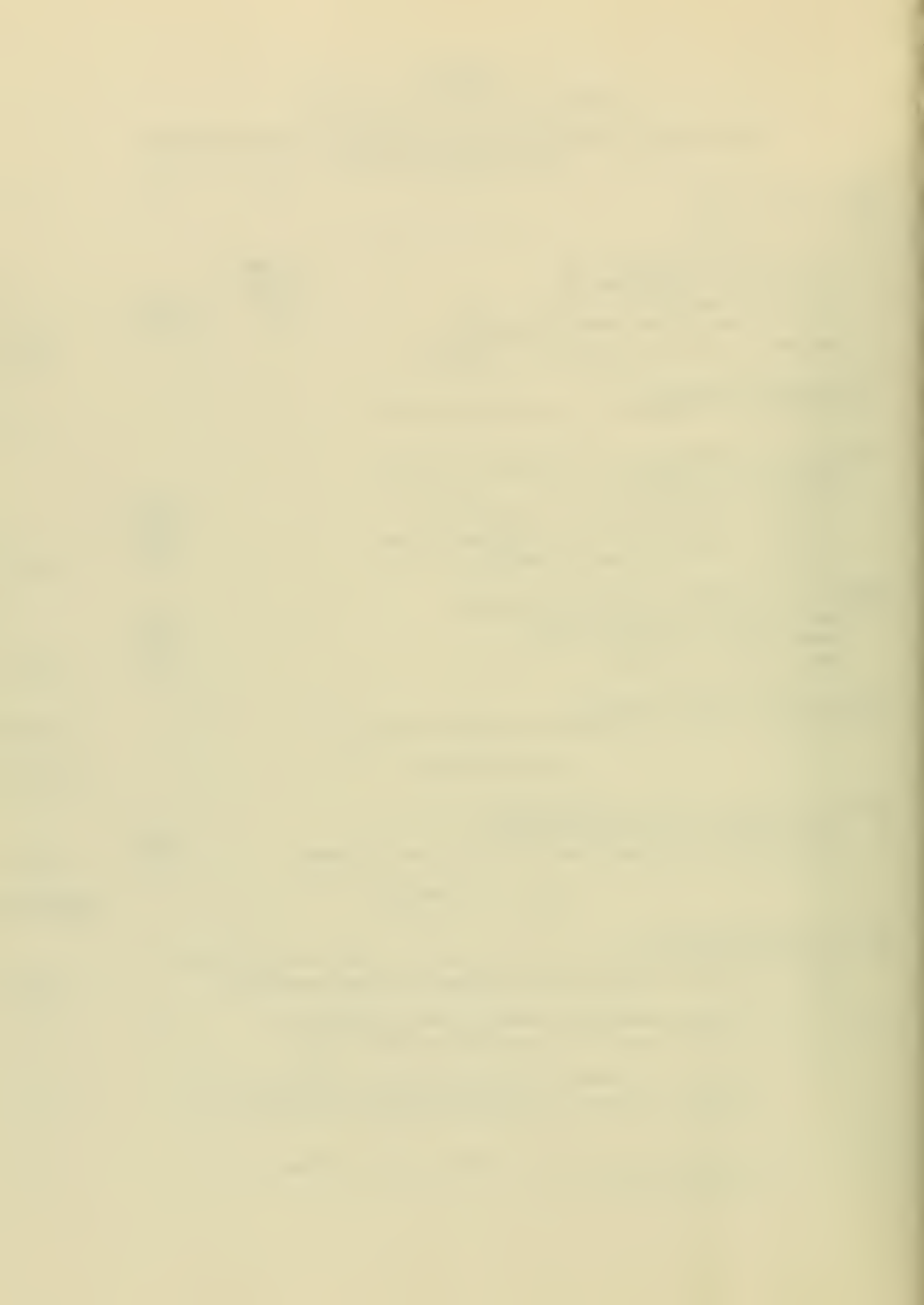


TABLE 16
BUREAU OF LIGHT, HEAT AND POWER
NEW CITY-OWNED STREET LIGHTING INSTALLATIONS
COMPLETED DURING FISCAL YEAR 1975-76

<u>Locations</u>	<u>Number of Lights</u>	<u>Type of Lights*</u>	<u>Value Value</u>
Financed by Bond Issues:			
Castle Manor Area	17	MV	\$ 40,690
Laurel Heights Area & California St.	114	MV	113,245
Market St. Reconstruction Cont. 1	111	SV	82,907
Market St. Reconstruction Cont. 2	165	SV	109,781
Market St. Reconstruction Cont. 2B	12	SV	9,125
Market St. Reconstruction Cont. 4	30	SV	21,180
Total	444		\$ 376,928
Financed by State Gasoline Tax:			
Buchanan St.-Grove to Hayes Sts.	2	MV	\$ 6,160
Evans St. - Third to Jennings Sts.	43	MV	64,970
Fairfax Ave. - Newhall to Mendell Sts.	14	MV	37,485
Galvez Ave., Newhall & Mendell Sts.	16	MV	30,510
North Water Front Area	21	MV	39,235
North Water Front Various Location	2	MV	5,990
Park Merced Area	306	MV	120,465
Turk St. - Divisadero St. to Masonic Ave.	20	MV	43,055
Total	424		\$ 347,870
Grand Total	868		\$ <u>724,798</u>

* MV - Mercury Vapor

SV - Sodium Vapor (High Pressure)

TABLE 17
BUREAU OF LIGHT, HEAT AND POWER
HISTORICAL COST OF CITY-OWNED STREET LIGHTING IMPROVEMENTS

<u>Fiscal Year</u>	<u>Ad Valorem Taxes</u>	<u>Gasoline Taxes</u>	<u>Street Lighting Bonds</u>	<u>Property Owners</u>	<u>State Highway Dept.</u>	<u>Miscellaneous Sources*</u>	<u>Total</u>
Prior to							
July 1, 1953	\$ 1,748,675	\$ 617,115	-	\$ 576,404	\$ 22,650	\$ 477,651	\$ 3,442,495
1953-54	142,151	22,181	-	23,495	2,274	1,239	191,340
1954-55	155,727	30,817	-	748	16,578	543	204,413
1955-56	15,704	48,620	-	2,484	19,181	1,360	87,349
1956-57	114,168	26,641	-	7,256	-	3,003	151,068
1957-58	2,501	64,942	-	18,199	4,142	-	89,784
1958-59	-	171,367	-	10,231	626	538	182,762
1959-60	-	100,126	-	35,874	10,242	4,083	150,325
1960-61	-	82,074	-	19,236	-	1,865	103,175
1961-62	-	200,113	-	116,376	24,550	7,993	349,032
1962-63	-	84,328	-	21,700	-	-	106,028
1963-64	-	340,108	-	32,556	6,000	-	378,664
1964-65	-	97,846	-	8,975	50,857	-	157,678
1965-66	-	474,673	\$ 522,899	-	-	-	997,572
1966-67	-	111,164	188,312	5,000	-	-	304,476
1967-68	-	175,949	331,941	-	-	-	507,890
1968-69	-	374,229	616,722	-	40,250	-	1,031,201
1969-70	-	359,635	261,000	-	-	-	620,635
1970-71	-	490,031	1,550,442	-	-	-	2,040,473
1971-72	-	541,534	1,810,011	-	-	-	2,351,545
1972-73	-	451,614	-	-	-	-	451,614
1973-74	-	266,764	236,314	-	-	-	503,078
1974-75	-	297,318	123,115	-	-	-	420,433
1975-76	-	347,870	376,928	-	-	-	724,798
Totals	\$ 2,178,926	\$ 5,741,059	\$ 6,017,684	\$ 878,534	\$ 197,350	\$ 498,275	\$ 15,511,828
Less: Cost of portions removed prior to fiscal year 1974-75						\$ 1,721,122	
Cost of portions removed during fiscal year 1975-76						198,302	
Original cost of City-owned facilities in service on June 30, 1976							\$ 1,919,424
							\$ 13,592,404

* Includes WPA and PWA (1935-1942). Boulevard Construction (1932-1934)
Municipal Railway, Recreation and Park Department and Housing Authority.

TABLE 13

HETCH HETCHY WATER AND POWERCONSTRUCTION CONTRACTSFISCAL YEAR 1975-76

Contract No.	Description	Contractor	Contract Time		Original Contract Price	Value of Work Done During Fiscal Year
			Started	Completed		
HH-443	Moccasin Dam Spillway, Construct Weir and Energy Dissipator and Red Mountain Bar Wasteway Training Wall	Hensel Phelps Construction Co.	9-2-75	3-18-76	287,500	310,708
HH-491	Fillmore Street, Pine to Hayes Underground Power Facilities	Abbett Electric Corporation	1-28-75	9-9-75	737,618*	155,519
HH-494	Replace, Repair and Paint Trolley Poles	Mahoney Electric Co., Inc.	1-6-76	-	185,246	175,841
HH-497	Church Street, 30th to 22nd Underground Duct System	Abbett Electric Corporation	4-19-76	7-12-76	109,590**	87,296
HH-502	Ocean Avenue, Junipero Serra Boulevard to Harold Avenue Underground Duct System	Ameico Electric	3-24-75	8-13-75	196,148*	566,698
HH-503	Taraval Street, and 46th Avenue, 20th Avenue to Vicente Street Underground Duct System	Peter Kiewit Sons' Co.	4-20-76	-	246,200**	111,297
HH-507	Cherry Road, Resurface, Mile Post 16.1 to Mile Post 23.4	George Reed, Inc.	9-29-75	10-2-75	40,729	37,542
HH-510R	Sandblast and Paint Spillway Drum Gates and Operating Cylinders and Piping for Slide Gates, O'Shaughnessy Dam	Ross F. Porter - Quality Painting	9-2-75	12-23-75	49,700	49,700

TABLE 18 (Cont'd)

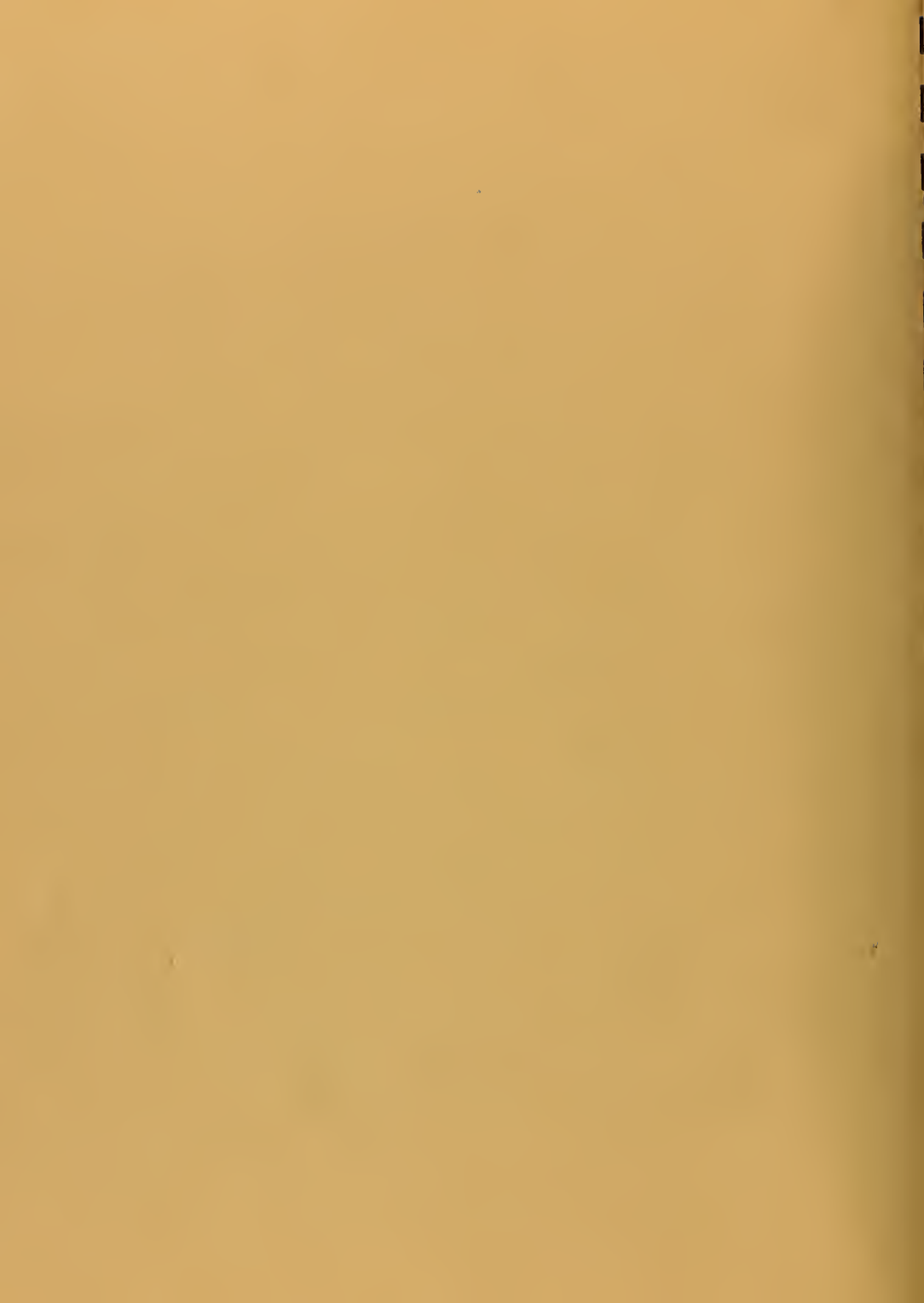
Contract No.	Description	Contractor	Contract Time		Original Contract Price	Value of Work Done During Fiscal Year
			Started	Completed		
HH-511R	San Joaquin Pipeline No. 2 Repair Lining	Granite Construction Co.	2-9-76	-	700,000	245,547
HH-512	San Joaquin River Valve House Repair and Piping	Vetter Plumbing Co., Inc.	8-27-75	5-26-76	7,229	7,229
HH-513	Holm Powerhouse Penstock Painting	M.B. Painting, Inc.	5-1-75	9-23-75	33,400	31,592
HH-515	Moccasini Shop and Warehouses Replace Windows	Seasonal Glass Products	8-3-75	9-18-75	4,877	4,877
HH-518	Tesla Portal, Overflow Shaft Extension	Dalzell Corporation	6-24-75	11-3-75	25,400	27,300
HH-519	19th Avenue, Randolph and Broad Streets, Underground Duct System	Venturini Corporation	5-14-75	10-24-75	179,780*	160,988
HH-521	Market Street Subway Electrification, Embarcadero Station to Duboce Portal	Amelco Electric	8-6-75	-	1,077,000	1,056,006
HH-522	Civic Center, Church and Downtown Substation, Installation of Electrical Equipment	De Narde Construction Co.	10-6-75	-	652,990	383,488
HH-525	Sutter Street, Presidio Avenue to Leavenworth Street Underground Duct System	R. Flatland Co.	2-2-76	-	372,835*	331,650
HH-526	McAllister Street, Divisadero Street to Leavenworth Street, Underground Duct System	R. Flatland Co.	6-2-76	-	248,430**	33,340

TABLE 13 (Cont'd)

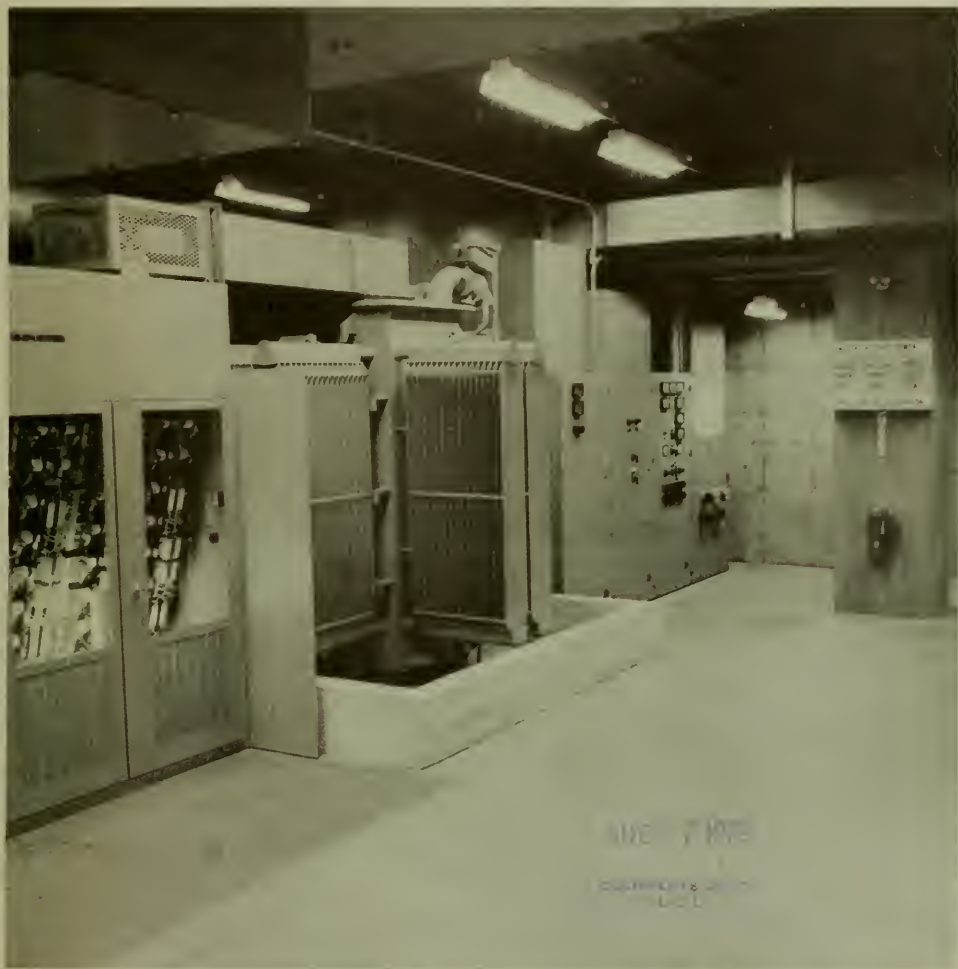
Contract No.	Description	Contractor	Contract Time		Original Contract Price	Value of Work Done During Fiscal Year
			Started	Completed		
HH-328	Laguna Honda and Judah Substations, Construct Buildings and Install Equipment	Herrero Brothers, Inc.	3-29-76	-	567,913	288,099
HH-531	Market Street Subway Electrification Duboce Junction to Eureka Station	Amelco Electric	5-4-76	-	195,428	32,771
HH-537	Ocean Avenue, Persia Avenue and Mission Street, Metro Center to Russia Street, Underground Duct System	Venturini Corporation	1-8-76	6-3-76	127,267*	119,034
HH-538	Sutter Street, Taylor Street to Presidio Avenue, Paint Trolley and Street Lighting Poles	Simon Painting Company	12-4-75	3-2-76	7,769	7,769
HH-541	Paint Steel Towers, Noccasin - Newark Transmission Line	Frank Brown Painting Contractor	6-21-76	-	56,260	5,738
Total Amount of Hetch Hetchy Contract Work Performed During Fiscal Year						\$3,720,629

* Includes City Furnished Manhole Frames and Covers @ \$272.00 per set

**Includes City Furnished Manhole Frames and Covers @ \$342.00 per set



HETCH HETCHY WATER AND POWER



CIVIC CENTER SUBSTATION

PUBLIC UTILITIES COMMISSION
CITY AND COUNTY OF SAN FRANCISCO

CITY AND COUNTY OF SAN FRANCISCO
PUBLIC UTILITIES COMMISSION

A N N U A L R E P O R T
FISCAL YEAR 1976-77

HETCH HETCHY WATER AND POWER SYSTEM
AND
BUREAU OF LIGHT, HEAT AND POWER

O. L. MOORE
GENERAL MANAGER

CITY AND COUNTY OF SAN FRANCISCO

GEORGE R. MOSCONE - MAYOR

PUBLIC UTILITIES COMMISSION

JOHN F. HENNING, Jr.	President
LYDIA LARSEN	Vice President
H. WELTON FLYNN	Commissioner
JOSEPH P. BYRNE	Commissioner
PETER McCREA	Commissioner
JOHN B. WENTZ	General Manager

ANNUAL REPORT
FISCAL YEAR 1976-77

HETCH HETCHY WATER AND POWER DEPARTMENT

ORAL L. MOORE - General Manager

This report is respectfully dedicated to Hetch Hetchy employees, past and present, whose devoted and conscientious efforts have made possible these accomplishments for San Francisco.



O'SHAUGHNESSY DAM AND HETCH HETCHY RESERVOIR
showing the effects of the drought in February, 1977.

HIGHLIGHTS

From the parched Redwood forests of the north state to the blazing deserts of the south, the one single aspect that dominated all of the water and power systems in California during the fiscal year is an unprecedented drought and its devastating impact. For the Hetch Hetchy Water and Power System, whose hydroelectric generation is totally dependent on water, and whose viability as a going concern is principally dependent on power revenue, the year has been a particularly difficult one financially.

The drought had its beginning in the winter of 1975-76 when lack of precipitation and meager snowmelt resulted in only 605,388 acre-feet of runoff into Hetch Hetchy Reservoirs during the spring of 1976, or 53 percent of normal. The second dry year, 1976-77, resulted in even less runoff during the past spring, totaling only 333,504 acre-feet, or 29 percent of normal. These record low inflows in successive years have left the three reservoirs in our mountain watersheds at less than 45 percent of capacity at the end of the report year.

Anticipating that the drought might continue into a second year, the Lower Cherry Aqueduct was reconditioned in the fall of 1976 in the event that water supply to the Hetch Hetchy Aqueduct would need to be supplemented with water from Cherry Reservoir. This turned out to be a farsighted move when drought conditions dictated shutting down Dion R. Holm Powerhouse and diverting this water into the aqueduct to the Bay Area in October 1976.

To further conserve water in our reservoirs against future public need, a request was submitted to the Secretary of the Interior, in March 1977, for permission to reduce fish releases from O'Shaughnessy Dam. So far, the Secretary has not advised us of any decision in the matter.

Based on the precipitation record for the water year commencing October 1, 1976, and the result of snow surveys conducted on our mountain watersheds, the San Francisco Public Utilities Commission instituted a mandatory 25 percent reduction in system water consumption. The reduction was put into effect May 1, 1977, in order to insure the ability of the Hetch Hetchy systems to meet the needs of the San Francisco Water Department and its service area during the continuing drought.

Comparing the amount of electric energy generated this year against that of previous years, the adverse impact of the drought is apparent. As generation was reduced to about 35 percent of normal, the resulting revenue available for supplying the cash flow for operating and maintaining the department was also reduced in roughly the same proportion. This necessitated rescinding many of the capital improvement projects scheduled for the year.

In spite of the above, work progressed on the federally assisted Power Improvement Program for the rehabilitation of the Municipal Railway transit power system. As of the end of the fiscal year, approximately \$26.5 million has been expended or encumbered. The professional services contracts for engineering design are 90 percent completed. Twenty-seven contracts for construction work and material purchases have been completed and twenty-two are currently in progress. Electrification of the Market Street Subway and Twin Peaks Tunnel is nearly completed. Ten of the eighteen substations are under construction, with three completed and in service. Thirty miles of the eventual fifty miles of underground duct lines are completed or under construction. Approximately 35 percent of the underground feeder cable has been installed, and an additional 20 percent is on order for delivery to current installation contractors. The conversion of the streetcar overhead trolley system for pantograph operation is progressing with all work on the "K" Line under construction; the "N" Line ready for bid; and the "J", "L" and "M" Lines in the final design stages.

HETCH HETCHY ORGANIZATION AND FUNCTIONS

Under policies established by the San Francisco Public Utilities Commission, the HETCH HETCHY WATER AND POWER DEPARTMENT and the BUREAU OF LIGHT, HEAT AND POWER serve the City and County of San Francisco in the dual function of operating department and service bureau.

Hetch Hetchy is a municipally-owned system of storage reservoirs and aqueducts which collects water from the Tuolumne River watershed and delivers it to the San Francisco Water Department. As a by-product of falling water, Hetch Hetchy operates and maintains hydroelectric generating stations and high voltage transmission lines for the production and distribution of electric energy.

Through its Transit Power Division, Hetch Hetchy has funded, operated, maintained and provided improvements for the electric facilities of the San Francisco Municipal Railway since July 1, 1969.

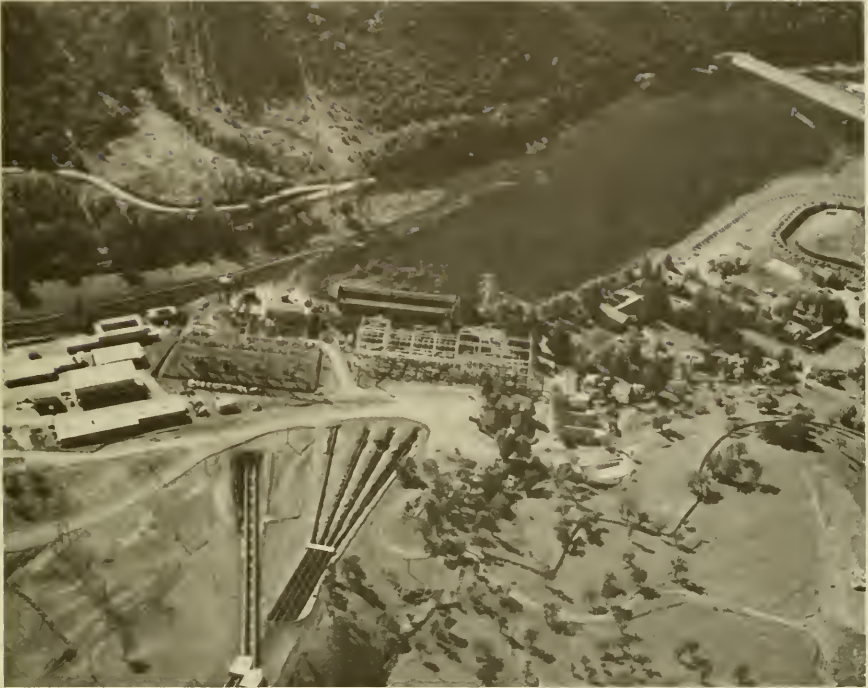
In order to handle this additional responsibility, Hetch Hetchy assumed control of the equipment and personnel of the Overhead Lines and Motive Power Sections of the Municipal Railway.

All of Hetch Hetchy's expenses, including those of the Transit Power Division, are supported by water and power revenues.

The Bureau of Light, Heat and Power administers contracts for furnishing electric, gas and steam services to municipal departments and handles monthly billings. It also administers contracts for furnishing street lighting services and for operation and maintenance of City-owned street lighting. Financing, design and construction of City-owned street lighting improvements are under the jurisdiction of the Department of Public Works, and plans for these improvements must be approved by the Public Utilities Commission through this Bureau. The Bureau is financed by appropriations from municipal departments and gas tax funds.

For fiscal year 1976-77, the Department administered budgeted funds for all purposes as follows:

<u>Budget</u>	<u>Number of Employees</u>	<u>Total Amount Appropriated</u>
Hetch Hetchy Water and Power	216	\$ 52,999,096
Hetch Hetchy Water and Power (Transit Power Division)	52	3,671,863
Bureau of Light, Heat and Power	<u>11</u>	<u>11,262,850</u>
	279	\$ 67,933,809



MOCCASIN POWERHOUSE AND RESERVOIR

HETCH HETCHY WATER AND POWER SYSTEM

REVENUE AND EXPENDITURES

Revenue from Hetch Hetchy Water and Power operations is derived principally from two sources:

1. Sale of water to the San Francisco Water Department
2. Sale of electric power and energy to San Francisco Municipal departments, Modesto and Turlock Irrigation Districts in the San Joaquin Valley, and seven industrial customers:

Kaiser Cement & Gypsum Corporation	Santa Clara County
Kaiser Aluminum & Chemical Corporation	Santa Clara County
Lockheed Missiles and Space Company, Inc.	Santa Clara County
General Motors Corporation	Alameda County
IBM Corporation	Santa Clara County
Liquid Air, Inc.	Alameda County
Norris Industries, Riverbank	Stanislaus County

WATER SALES

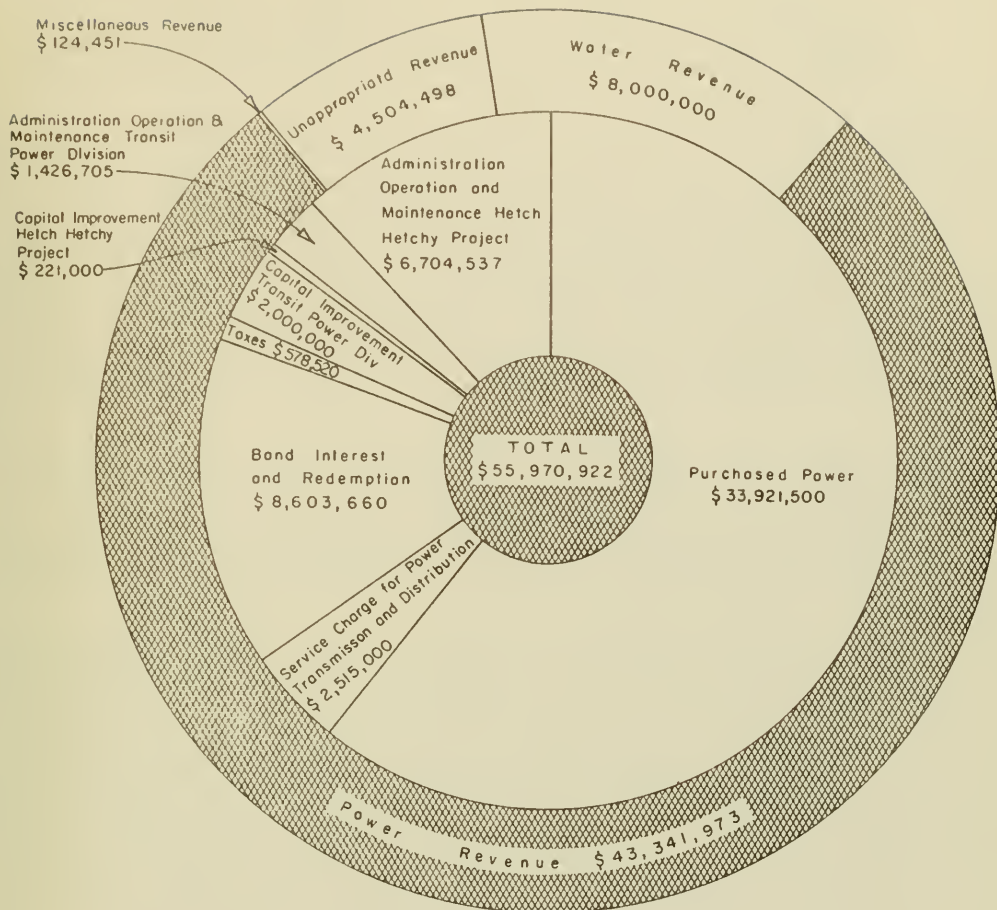
This past year, revenue from the sale of water and standby service to the San Francisco Water Department was \$8 million.

POWER SALES

Gross sale of electric energy was \$43,341,973, up from \$19,693,525 during 1975-76. This doubling of revenue is deceiving, since the increase does not represent extra return on project investments for the following reasons:

1. The increase is principally due to the record-breaking amount of supplementary power and energy which City had to purchase for resale, on account of the drought, and which was resold to the customers at substantially the same high price at which it was purchased.
2. The offset to this year's so-called record revenue, in terms of expenditure for supplementary power and energy, is \$33,921,500 instead of the \$2,100,000 budgeted, leaving only \$9,420,473 in net revenue from gross, a far cry from the record net of over \$18 million for 1974-75.

Power and energy delivered to City Departments increased 2.0 percent over the previous year, about the same rate as in 1975-76. The City department mainly responsible for this increase is the San Francisco International Airport. Consumption at the Airport, the single largest energy consumer among the City Departments,



HETCH HETCHY REVENUES
AND EXPENDITURES
FISCAL YEAR 1976-77

has increased by 3.2 percent, indicative of a resurgence of construction and expansion activities. Requirements for the Municipal Railway appear to have increased by 9.5 percent over the previous year. This is not a valid comparison, of course, because of last year's low consumption due to shutdown of the public transportation system during the 38-day employees' strike.

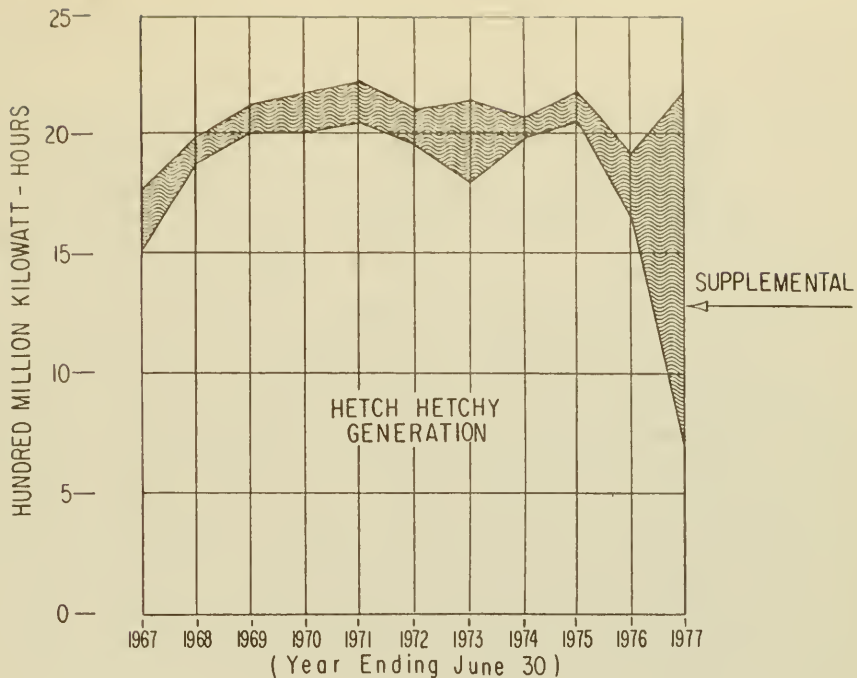
Power and energy delivered to Modesto Irrigation District, Hetch Hetchy's largest power customer, and to Turlock Irrigation District, the third largest, increased by 17.2 percent and 37.9 percent respectively this year. These increases are directly related to the drought. The storage in Don Pedro Reservoir, upon which the two Districts are dependent for generation and irrigation needs, has been going down steadily and the Districts have been extremely careful in using this precious and meager resource. Since Hetch Hetchy is in the same predicament, 86 percent of the power delivered to the Districts by Hetch Hetchy had to be supplied from supplementary power and energy purchased from the Pacific Gas and Electric Company.

Total generation of 710,002,000 kilowatthours for the report year from the project's three plants (the lowest production since 1969) amounts to 43 percent of the output of 1,640,471,000 kilowatthours in 1975-76. The financial strength of the Department resulting from this decline in electric energy generation has been severely impaired. If current conditions continue, additional shortfall in operating revenue in the upcoming fiscal year can be anticipated.

Hetch Hetchy power is sold at cost to City Departments for municipal purposes, representing a saving to taxpayers for 1976-77 of approximately \$4 million, compared to the cost if supplied by the local investor-owned utility at rates which include a "fuel cost adjustment" to account for the additional costs brought on by the unending price increases in oil, gas and coal fuel used for electric generation. Beginning September 1976, revised rates for Hetch Hetchy power, approved by the Commission on July 13, 1976, became effective for private consumers and municipal users. The higher rates boosted power revenue from these sources by nearly \$1 million in the fiscal year. This is just another step in our continuing effort to base our power rates on the value of power in the market place, in order to maximize the return of the power that is produced from the Hetch Hetchy system. In a fiscal year where generation is at a record low, this increase helped to somewhat ease the economic dislocation brought on by the reduced generation.

SYSTEM PLANNING

As part of our efforts to increase rainfall in our mountain watersheds, in light of the lessons learned from the drought, the



HETCH HETCHY ELECTRIC ENERGY SOURCES



REVENUE FROM SALE OF ELECTRIC ENERGY

Department has been investigating the feasibility of a weather modification program. The goal is to increase precipitation by cloud seeding of appropriate storms in the area. Preliminary data indicate that our effort should be directed to the Cherry Watershed. As an initial step to bring this program to fruition, plans are under way to hire expert consultants for the preparation of an Environmental Impact Report.

On October 22, 1976, the City and County of San Francisco, through the Public Utilities Commission, together with the Modesto and Turlock Irrigation Districts, submitted an "Amended Application for Preliminary Permit, Clavey-Wards Ferry Project" to the Federal Power Commission. The application was made in order that the City and the Irrigation Districts might secure and maintain priority for a license under the Federal Power Act. The proposed project consists of three small dams and related facilities designed to harness the unused power potential of the Tuolumne. They would be situated on the upper reaches of the river below the City's Dion R. Holm and Robert C. Kirkwood Powerhouses and upstream from Don Pedro Dam. It is estimated that the project has a capability of generating 400 megawatts of power as well as a new water supply of 11,900 acre-feet. However, actual development will depend on the outcome of a study by federal agencies for possible inclusion of this portion of the river in the federal wild and scenic river system.

OPERATION AND MAINTENANCE

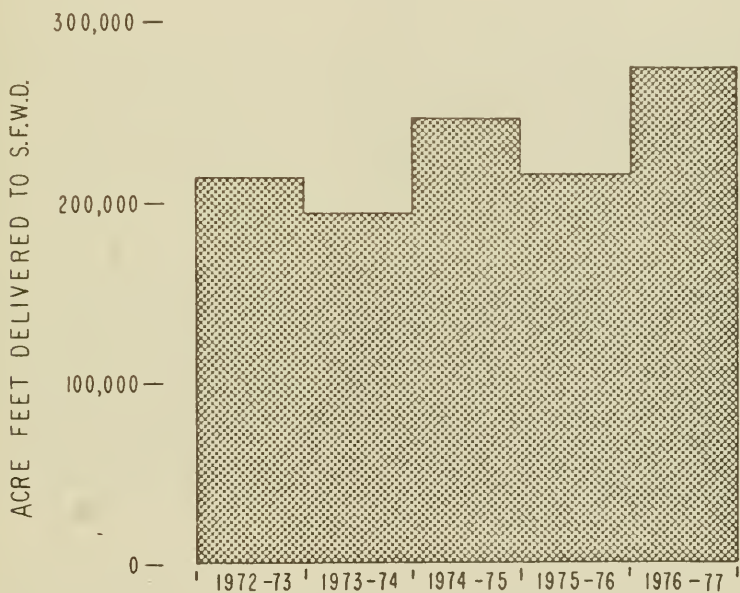
On Sunday, November 7, 1976, at approximately 0822 hours, the 13,800 volt metal-clad switchgear unit through which power is supplied to the 2,500 kVA Ridge Line transformer from Generator No. 2 at Dion R. Holm Powerhouse failed during routine testing of a protective device. The failure resulted in destruction of the circuit breaker element and related appurtenances. However, service to the Ridge Line was promptly restored by connecting it to the Mather Line, which is supplied from Robert C. Kirkwood Powerhouse. Necessary replacements were purchased from General Electric and installed by Department personnel with final adjustment and testing performed by field engineers from General Electric. All work was completed and service to the Ridge Line reverted to Dion R. Holm Powerhouse on June 3, 1977.

WATER PRODUCTION AND TRANSMISSION

Precipitation recorded for the year at our measuring stations was 52 percent of the long term average. Much of this amount fell during the normally dry summer months and did not run off.

During the year, 89,103,588,000 gallons of water were diverted from the Tuolumne River watershed through the Hetch Hetchy Aqueduct to the San Francisco Water Department, representing 105 percent of the City's total customer consumption. The water deliveries represent a decision by the Water Department to increase its local storage reserve. In addition, 223,307,920 gallons, down 6 percent from last year, were delivered to the United States Atomic Energy Commission at Mocho Shaft of the City's Coast Range Tunnel for use at the Lawrence Radiation Laboratory at Livermore; 58,864,608 gallons, up 19 percent over 1975-76, were delivered to Groveland Community Service District in Tuolumne County from the Mountain Tunnel.

Appendix Table 6 shows comparative data on precipitation, runoff, storage and delivery of the Hetch Hetchy Water Supply System.



DELIVERIES OF WATER TO
SAN FRANCISCO WATER DEPARTMENT

OPERATION AND MAINTENANCE - TRANSIT POWER DIVISION

The Transit Power Division is responsible for supplying the 600 volt direct current power that is necessary to operate the street-cars and trolley coaches of the San Francisco Municipal Railway.

The Transit Power Division is composed of two sections - the Motive Power Section and the Overhead Lines Section.

Motive Power Section

The Motive Power Section operates and maintains ten substations which convert electric power from 12,000 volts alternating current to 600 volts direct current by means of motor-generators, synchronous converters, mercury arc rectifiers and silicon rectifiers. (See Appendix Table 3 for statistical data.) Motive Power is also responsible for maintaining the electric motors and associated control equipment for operating the cable-winding machinery located in the Cable Car Powerhouse at Washington and Mason Streets. In addition, Motive Power periodically inspects, cleans, adjusts and repairs the streetcar and trolley coach headway recorders at Central Control of the Municipal Railway. The substations operate 24 hours per day, 365 days per year.

In anticipation of the need to assume responsibility for eighteen new substations being built by the Power Improvement Program (reported elsewhere in this report), this section perused and commented on the wiring and control schemes proposed for these stations. The first of the new electrical substations, Civic Center Station, was placed in revenue service in December of 1976. A commissioning ceremony was held by Mayor George Moscone who dedicated this first station to the service of the citizens of San Francisco.

A new mimic board showing the new stations in schematic form was constructed and installed at the Bryant Substation. As each new automatic station is completed and becomes operational, it will be monitored and controlled from this remote location via telephone lines. Since Civic Center, Church, Judah, Outer Mission and West Portal Stations are presently unmanned, controls for these stations were designed and installed on this new mimic board. This new status display and control board will continually be augmented with additional automatic station controls until such time as it shall be superseded by a more sophisticated and flexible Supervisory Control System.

Overhead Lines Section

The primary function of the Overhead Lines Section is to maintain in satisfactory operating condition the trolley wire overhead facilities and the electric distribution system which conveys power to it. This electric distribution system consists of both overhead lines and underground cables.

Secondary functions include the maintenance of the Municipal Railway Signal Systems and the electric light and power installations at all Municipal Railway buildings.

During fiscal year 1976-77, the Overhead Lines Section responded to 3,943 emergency calls, an increase of 8 percent over the prior year. In addition to emergency calls, this section performed a regular and extensive ongoing maintenance program. All overhead and underground facilities were systematically inspected and all worn or damaged parts that could cause accidents or equipment malfunctions were replaced. This section also operates an emergency crew 24 hours a day year round, including all holidays. The main work crew normally worked on the day shift but occasionally was assigned to night work to overhaul facilities during the hours Muni trolleys and streetcars do not run.

A considerable amount of damage to overhead facilities was caused by trolley coaches de-wiring and snagging their poles in the overhead facilities and tearing them down, or by breaking the spans with the flaying poles. Such damage was repaired at no cost to the Municipal Railway. Other parties who damaged our facilities were billed for the cost of repairs. This included damage to overhead facilities caused by high loads on trucks or careless operation of crane equipment and damage to underground feeder cables by contractors digging into our duct lines. During 1976-77, responsible parties were billed for 9 damage cases totaling \$17,246.41. The Overhead Lines Section also performed work for 4 building owners and contractors under work orders amounting to \$2,994.82. This work included moving trolley poles to accommodate driveways; relocating trolley poles and feeders to permit construction of new buildings; temporarily removing trolley wires and feeders to permit passage of high loads; and shifting of trolley wires and feeders for various excavations.

The Overhead Lines Section engaged in many other activities of a related nature which it is especially equipped to perform. These additional duties included repairs, maintenance and construction of electrical systems in Muni's car barns, offices and shops; welding and rebuilding of worn overhead lines special work; making and rebuilding parts for switches, warning block signals, car recorders, and strandalarms for the cable car system; installing mobile radio equipment; installing streetcar and bus stop signs and public information signs.

ENGINEERING DIVISION

The Engineering Division of Hetch Hetchy Water and Power provides engineering services for the Hetch Hetchy Project, Transit Power Division and the Power Improvement Program. These services include the preparation of studies, reports, cost estimates, and plans and specifications for new construction, for replacement of structures and for items of major maintenance. Surveying, inspection of construction, contract administration and payment recommendations are provided for all construction work under Hetch Hetchy Water and Power. Work of unusual magnitude or which requires special knowledge and expertise is done by engineering consulting firms which have the necessary manpower and qualifications. The Engineering Division is organized into six main sections: Civil and Construction, Electrical, Mechanical, Architectural, Engineering Administration, and Special Projects (Power Improvement Program).

During the year, plans and specifications were prepared for the following work to facilitate and maintain Hetch Hetchy operations:

HH-454 - Moccasin Sewage Treatment Plant

A package sewage treatment plant has been planned to replace the existing septic tank system. This process is a carryover from last year due to the lengthy process required to obtain approval for a federal "Clean Water Grant". State and federal permission to begin preparation of final plans and specifications was given in September, 1976. Approval of the final plans and specifications was obtained in March, 1977. The construction contract has subsequently been awarded with work to begin in August, 1977.

DAVID SHAW, STATIONARY ENGINEER,
PERFORMING A TEST AT THE MOCCASIN
SEWAGE TREATMENT PLANT



HH-514 - Moccasin Administration Building, Replace Heating System

Under this contract, completed during the year, the old heating system, using costly fuel oil, was replaced by a new electrical heating/ventilating system. In addition, extensive electrical improvements were made to bring the existing electrical system up to code requirements, and extensive plumbing and architectural improvements were also made.

HH-549 - Bryant Substation and Power Control Center

The Power Control Center (part of the Power Improvement Program described elsewhere in this report) was originally to be installed in the existing Bryant Substation building. When engineering investigations of this 1904 building revealed that it did not meet seismic standards, it was determined to construct a new building to house both the Control Center and the new substation. The Control Center portion of the building will accommodate the facilities for remote supervisory control of the eighteen new automatic substations that will provide electric power for the Municipal Railway. The design of the substation portion of the building was performed by our consultants under the Power Improvement Program. The design of the Power Control Center portion of the building has nearly been completed by Hetch Hetchy personnel. The design of the facility has received approval of the Art Commission and a City Planning Commission Environmental Impact Report determination of no significant effect on the environment.

HH-555 - Red Mountain Bar Surge Shaft Cover

A construction contract was let to cover the surge shaft with a steel frame and steel sheets to provide a barrier against debris entering the water supply.

HH-557 - Paint Steel Trolley Poles, Various Locations

A construction contract was let to prepare and paint trolley poles in numerous locations throughout the City. This work is part of a continuing program to rehabilitate all of the trolley poles in the City that are not to be replaced under the Power Improvement Program or other federal grant.

HH-565 - Lower Cherry Aqueduct Rehabilitation

In anticipation of a continued drought, an emergency construction contract was let to rehabilitate the Lower Cherry Aqueduct in order to supplement the water supply to Hetch Hetchy Aqueduct with water from Lake Lloyd and Lake Eleanor. This three mile long aqueduct was originally constructed in 1917, had not been used since 1960, and was in poor condition. The contract has been completed and diversion of water began in November 1976 with a capability of supplying approximately 130 mgd into the Hetch Hetchy Aqueduct at Early Intake.

HH-566 - San Joaquin Valve House - Backflow Prevention and
Replacement of Miscellaneous Pipeline Appurtenances

Design of this facility has been directed toward a determination of the actual water level in Elliott Cut and how it is controlled.

HH-568 - Moccasin New Vehicle Refueling Station

Plans and specifications have been completed to replace and relocate the existing vehicle refueling station that does not meet present operating and safety requirements. The new location will also provide for the new air pollution control regulations.

HH-573 - Replace, Repair and Paint Trolley Poles, Various Locations

A contract was let to replace, repair and paint trolley poles at various locations. This work is part of a continuing program to rehabilitate all of the trolley poles in the City that are not to be replaced under the Power Improvement Program or other federal grant.

HH-576 - Hughes Leithold and Foothill Waterlines
Replace and Repair

Design work on this project involved research into the actual loss of water from natural springs that resulted from the construction of the Foothill Tunnel in the 1930's, and included field surveys to the existing temporary supply system.

POWER IMPROVEMENT PROGRAM

Work during fiscal year 1976-77 under the UMTA-approved Federal Grant for the Power Improvement Program was as follows:

1. Grant Amendment

Amendment No. 2 to the Project Grant was approved by UMTA on July 21, 1976. This final amendment provides sufficient funds for the balance of the Project and increases the total Project Cost to \$50.5 million and the Federal Grant to \$36.5 million.

2. Project Status

As of the end of the fiscal year, approximately \$26.5 million has been expended or encumbered. The professional services contracts for engineering design are 90 percent completed. Twenty-seven contracts for construction work and material purchases have been completed and twenty-two are currently in progress. Electrification of the Market Street Subway and Twin Peaks Tunnel is nearly completed. Ten of the eighteen substations are under construction, with three completed and in service. Thirty miles of the eventual fifty miles of underground duct lines are completed or under construction. Approximately 35 percent of the underground feeder cable has been installed and an additional 20 percent is on order for delivery to current installation contractors. The conversion of the streetcar overhead trolley system for pantograph operation is progressing with all work on the "K" Line under construction, the "N" Line ready for bid and the "J", "L" and "M" Lines in the final design stages. Details of the various projects and contracts are in the following sections.

3. Electrification and Overhead Conversion

A) Contracts

Construction was essentially completed on Contract HH-521, Market Street Subway Electrification, Embarcadero Station to Duboce Portal. Modification of Contract No. 5, in the amount of \$122,690, for corrective work required for final alignment of the catenary system to suit field conditions, was approved by UMTA on June 9, 1977. The Contractor commenced work on the modification.

Construction neared completion on Contract HH-531, Market Street Subway Electrification, Duboce Junction to Eureka Station.

All PIP work included in Contract MR-622R, Twin Peaks Tunnel Electrification, Structural Repairs and Improvements was completed on June 17, 1977.

JUNIPERO SERRA BLVD. LOOKING NORTH FROM OCEAN AVE.



BEFORE-Overhead feeder cables and streetcar trolley overhead



AFTER-New trolley/streetlight poles and pantograph type overhead

Plans and specifications for Contract HH-524, K Line Streetcar Overhead System, Conversion for Pantograph Operation, were completed and transmitted to UMTA for approval on November 2, 1976. Following approval of plans and specifications by UMTA, bids were received on December 2, 1976. The contract was awarded on December 14, 1976 to Amelco Electric, San Francisco, California, who submitted the low bid of \$239,000. The contract was certified by the City Controller on January 24, 1977. Construction commenced on February 21, 1977.

Plans and specifications for Contract HH-536, Streetcar Overhead System, West Portal Avenue, Conversion for Pantograph Operation, were completed and transmitted to UMTA for approval on July 28, 1976. Following approval of plans and specifications by UMTA, bids were received on August 26, 1976. The contract was awarded on September 14, 1976 to Mahoney Electric Co. Inc., San Francisco, California, who submitted the low bid of \$295,671. The contract was certified by the City Controller on October 21, 1976. Construction commenced on November 8, 1976.

Construction was completed on Contract HH-517, K-Line Transit Power Facilities, Street Lighting and Related Work. Included was the installation of new trolley poles and overhead trolley wire reconstruction for pantograph operation on Junipero Serra Boulevard.

Construction on Contract MR-620, "K" Line, Ocean Avenue at Route 280 Overpass, Track Reconstruction and power Facilities, was completed. Included was overhead trolley wire reconstruction for pantograph operation.

Final contract documents for Purchase Contract No. 1 for Special Trolley Coach/Streetcar Crossing Hardware were completed and transmitted to the City Purchaser. The special hardware will be purchased by the City, due to the six-month manufacturing lead time, and will be furnished to several installation contractors. The contract was advertised by the City Purchaser on October 4, 1976. Bids were received on October 29, 1976. The contract was awarded to Ohio Brass Co., who submitted the sole bid in the amount of \$20,049. The manufacturer, Ohio Brass Co., completed fabrication of the special trolley coach/streetcar crossing hardware and delivery was made on June 8, 1977.

Final contract documents for Purchase Contract No. 2 for Special Trolley Coach/Streetcar Crossing Hardware were

completed and transmitted to the City Purchaser. Bids were received on May 20, 1977. On June 27, 1977, the City Purchaser awarded the contract to Ohio Brass Co., who submitted the low bid of \$24,275.

During this year, the Municipal Railway outfitted an existing PCC streetcar with an LRV pantograph, floodlights, and an observation window in the roof. The location of the pantograph on this PCC is essentially identical to its location on the new LRV streetcars now being manufactured for the City of San Francisco. This car was and will be used by Hetch Hetchy as an overhead trolley system test car, testing the catenary systems installed in the Market Street Subway and Twin Peaks Tunnel and testing the surface overhead trolley systems being converted for pantograph operation under various contracts. The car will remain in regular passenger service except when required for testing.

B) Design

The Consultant, PBQ&D, Inc. and Gibbs & Hill, Inc. (PBGH) continued work on final design contract plans and specifications.

Hetch Hetchy review continued on plans and specifications at the 95 percent completion level as submitted by the Consultant for streetcar overhead system conversion for pantograph operation for Contracts HH-530 ("J" Line - Duboce to 17th Street), HH-532 ("N" Line), HH-533 ("J" Line), HH-534 ("L" Line), and HH-535 ("M" Line), with emphasis on Contract HH-532 ("N" Line).

Review was completed on the 95 percent completion level plans and specifications for Contract HH-532, "N" Line Streetcar Overhead System, Church Street to Nineteenth Avenue, Conversion for Pantograph Operation, and Sunset Tunnel Electrification. Comments were transmitted to the Consultant, PBGH, for incorporation into the final contract documents. Following return of plans and specifications from the Consultant, with corrections, preparation of final contract documents commenced. Contract is scheduled to be advertised in August 1977.

Plans and specifications to be included in DPW Contracts 23,919 and 23,920 - Judah Street, 19th to 32nd Avenue and 32nd Avenue to La Playa, Street Improvement and Track Reconstruction, were completed and transmitted to the Department of Public Works. The work to be included consists of replacement of trolley poles and conversion of the streetcar overhead system for pantograph operation.

This work was formerly part of Contract HH-532, and the plans and specifications were prepared by the Consultant, PBGH. The plans and specifications were approved by UMTA on May 13, 1977, and June 27, 1977 respectively. Plans and specifications for DPW Contract 23,919 were approved by the State (FAU) on June 23, 1977. The contract is scheduled to be advertised by DPW in July 1977. Advertising of DPW Contract 23,920 is awaiting approval by the State (FAU).

Plans and specifications for new trolley pole foundations on the "M" Line from St. Francis Circle to Junipero Serra Boulevard were completed and delivered to Muni (TIP) on May 27, 1977 for inclusion in Contract MR-643, "M" Line Rerailing. The new trolley poles and overhead conversion work will be done later under Contract HH-535.

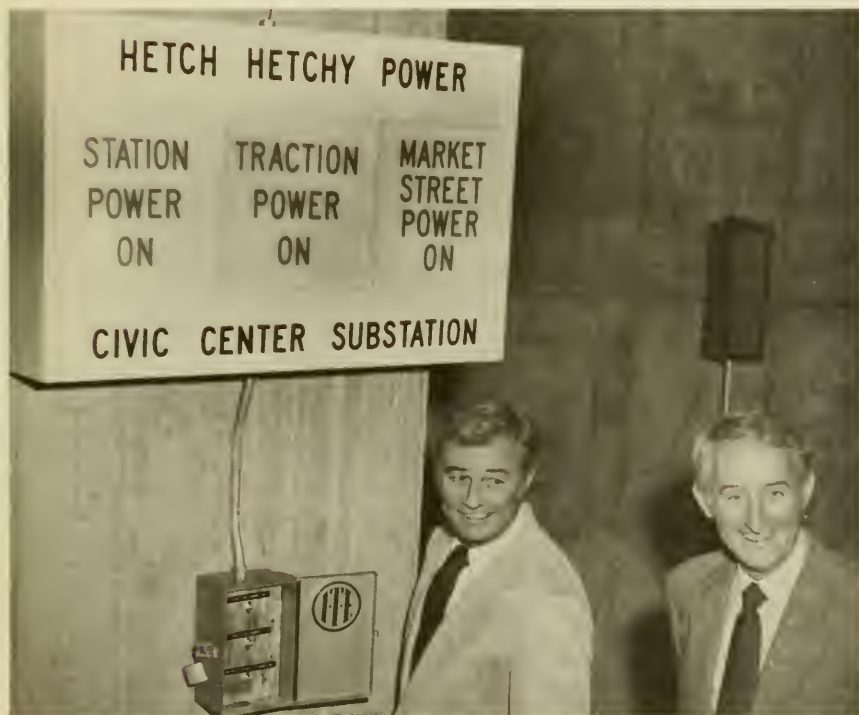
Plans and specifications were completed and transmitted to Muni (TIP) on March 31, 1977 for Contract MR-642, West Portal Avenue, Track Reconstruction. The work to be included consists of the relocation of the streetcar overhead to suit the new track alignment.

The Consultant completed work of determining the nature, degree, cause and correction of deviations in catenary construction from contract designs in the Market Street Subway. Drawings for the corrective work were completed and issued to the Contractors.

4. Substations

A) Contracts

Construction neared completion on Contract HH-522, Civic Center, Church, and Downtown Substations, Installation of Electrical Equipment. The Contractor completed installation of substation equipment and performed pre-energization tests at Church and Civic Center Substations. On November 23, 1976, the Civic Center Substation was dedicated and Unit No. 2 (12 kV ac switchgear, transformer, 4000 kw silicon diode rectifier and 600 V dc switchgear) was placed in operation. On December 23, 1976, Unit No. 1 (12 kV ac switchgear, transformer, 4000 kw silicon diode rectifier and 600 V dc switchgear) was placed in operation. On March 21, 1977, the second major unit of the Power Improvement Program, Church Substation, consisting of two 4000 kw transformer-rectifier units and associated 12 kV ac and 600 V dc switchgear, was placed in operation. Unit No. 1, Phase I at Downtown Substation (12 kV ac switchgear, transformer, 4000 kw silicon diode rectifier and 600 V switchgear) was inspected, tested and on July 22, 1976



The Honorable George Moscone, Mayor, and Oral L. Moore, General Manager, Hetch Hetchy Water and Power, at the dedication ceremony of the Civic Center Substation, November 23, 1976.

placed in operation and began supplying 600-volt dc power to Muni vehicles on lower Market Street and adjacent areas. Installation of Unit 1, Phase I equipment completed the first of four phases required to replace the obsolete rotating machines with modern equipment while keeping the substation in operation. The Contractor completed the removal of the old equipment and prepared for installation of the remainder of the new equipment in the final Phase IV of the conversion.

Construction neared completion on Contract HH-528, Laguna Honda and Judah Substations, Construct Buildings and Install Equipment. On April 29, 1977 Judah Substation was energized and load tested. This single-unit 4000 kw rectifier substation began providing power for the "N" Line streetcars on Judah Street from 20th Avenue to La Playa on May 3, 1977.

Construction commenced on Contract HH-529, Carl Substation, Construct Building and Install Equipment, on July 19, 1976.

Bids were received on July 15, 1976 for Contract HH-544, Fillmore Substation, Construct Building and Install Equipment. The contract was awarded on July 27, 1976 to Herrero Brothers, Inc., San Francisco, California, who submitted the low bid of \$641,840. The contract was certified by the City Controller on August 25, 1976. Construction commenced on September 13, 1976.

Plans and specifications for Contract HH-546, Randolph Substation, Construct Building and Install Equipment, were completed and transmitted to UMTA for approval on November 8, 1976. The plans and specifications were approved by UMTA on November 24, 1976. Bids were received on January 13, 1977. The contract was awarded on January 25, 1977 to Kaplan-Jones, Joint Venture, who submitted the low bid of \$226,900. The contract was certified by the City Controller on February 14, 1977. Construction commenced on March 7, 1977.

Plans and specifications for Contract HH-547, San Jose Substation, Install Equipment, were completed and transmitted to UMTA for approval on September 14, 1976. The plans and specifications were approved by UMTA on September 28, 1976. Bids were received on October 14, 1976. The contract was awarded on October 26, 1976 to L. K. Comstock & Co., Inc., who submitted the low bid of \$84,790. The contract was certified by the City Controller on February 3, 1977. Construction commenced on February 28, 1977.

Plans and specifications for Contract HH-548, Taraval Substation, Construct Building and Install Equipment, were completed and transmitted to UMTA for approval on January 11, 1977. The plans and specifications were approved by UMTA on February 3, 1977. Bids were received on February 24, 1977. The contract was awarded on March 8, 1977 to J. DiGiorgio & Sons, who submitted the low bid of \$253,950. The contract was certified by the City Controller on March 23, 1977. Construction commenced on April 18, 1977.

B) Design

The Consultant, Bechtel, Inc., completed design work on the substation buildings and equipment installation.

Final plans and specifications for Contract HH-549, Bryant Substation, Construct Building and Install Equipment, were received from the Consultant in May 1977. The plans and specifications will be included in one contract for the construction of the Bryant Substation and Power Control Center Building. The design for the Power Control Center portion of the building is nearing completion by Hetch Hetchy Engineering personnel.

Final plans and specifications for Contract HH-550, West Portal Substation, Install Equipment, were received from the Consultant in October 1976. Advertising of the contract must be deferred until the structure, which is a part of the new West Portal Station being constructed by BART, is completed sufficiently in early 1978.

Final plans and specifications for Contract HH-551, Richmond Substation, Install Equipment, were received from the Consultant in April 1977. Advertising of the contract must be deferred until the new West Portal Substation is completed in 1978, and the equipment from the existing West Portal Substation will be available for relocation to Richmond Substation.

Advertising of Contract HH-545, Outer Mission Substation, Install Equipment, is being deferred until the completion of the new San Jose Substation under Contract HH-547. The plans and specifications for HH-545 were previously completed by the Consultant. This is necessary so that the Outer Mission Substation can be shut down during reconstruction and its load temporarily assumed by the San Jose Substation.

The building design for the new combined Bryant Substation and Power Control Center received approval from the San Francisco Art Commission.

The City Planning Commission issued a negative declaration of environmental impact and approved the project as conforming to the Master Plan.

C) Equipment Purchase

The substation equipment manufacturer, ITE-Gould, completed production on the \$5,896,000 purchase contract.

Review of shop drawings submitted by ITE-Gould was completed.

Negotiations were conducted with ITE-Gould for a contract modification to provide additional equipment for Laguna Honda Substation. The second rectifier, transformer and related switchgear to be purchased will provide power reliability in the Twin Peaks Tunnel. This addition to the Project was approved by UMTA in the Grant Amendment.

Deliveries of equipment under the purchase contract were virtually completed. Equipment for Laguna Honda, Judah and Downtown Substations were received by the Contractors, Herrero Brothers, Inc. (Laguna Honda and Judah) and DeNarde Construction Co. (Downtown) and is being installed. This completed delivery to the site for five substations. For the remaining substations, all items of the equipment, except for minor shortages, are on hand at the local warehouse for later pickup by the installation contractors.

Meetings were held with factory representatives from ITE-Gould to resolve outstanding minor problems that have developed during installation and initial operation of the new substation equipment.

The Service Engineer, assigned by ITE-Gould to assist during installation and testing of the new equipment, continued to provide assistance at Downtown, Civic Center, Church, Laguna Honda and Judah Substations.

Work continued on the preparation of plans and specifications for the purchase of additional substation equipment for Stations E, F, J and N.

5. Control and Communications

Plans and specifications at the 90 percent completion level for Contract HH-569, Supervisory Control System, Equipment Purchase and Installation, were resubmitted by the Consultant, Systems Control, Inc., in January 1977. Review was completed, and the plans and specifications were returned to the Consultant with comments and corrections to be incorporated into the final plans and specifications.

Plans and specifications at the 90 percent completion level for Contract HH-574, Communication Cable and Subway Maintenance Telephone System, Installation Contract No. 1, were submitted by the Consultant. Review was completed and the plans and specifications were returned to the Consultant with comments to be incorporated into the final plans and specifications.

Amendment No. 1 to the existing professional services agreement was negotiated with the Consultant. The amendment provides for additional design services necessary to extend the supervisory control system to the four additional substations - E, F, J and N, recently added to the PIP, and to increase the flexibility of the maintenance telephone system. The amendment which increases the total cost of the agreement from \$85,895 to \$93,607, was approved by the PUC on August 24, 1976, and was certified by the City Controller on September 28, 1976.

6. Cable Purchase

Orders totaling 370,000 feet of insulated power cable were placed during the fiscal year for contracts in progress that require City-furnished cable. A total of approximately 780,000 feet of cable has been purchased under the contract with Cyprus Wire & Cable Company, which expired on June 30, 1977. Efforts to extend the contract were unsuccessful.

Contract documents were prepared and transmitted to UMTA on June 13, 1977 for a new contract to provide the estimated 650,000 feet of cable required to complete the planned work under the Power Improvement Program. The contract documents were approved by UMTA on June 21, 1977. Bids are scheduled to be received by the City Purchaser on July 8, 1977.

7. Feeder Undergrounding

A) Church Street - 22nd Street to 30th Street - Underground Duct System (Contract HH-497)

All work on this contract was completed in accordance with contract plans and specifications on July 14, 1976.

B) Taraval Street and 46th Avenue - 20th Avenue to Vicente Street - Underground Duct System (Contract HH-503)

All work on this contract was completed in accordance with contract plans and specifications on October 8, 1976.

C) K-Line, Transit Power Facilities, Street Lighting and Related Work (Contract HH-517)

All work on this contract was completed in accordance with contract plans and specifications. Included was underground

feeder cable installation in previously constructed duct banks on West Portal and Ocean Avenues and Junipero Serra Boulevard.

D) Sutter - Presidio Avenue to Leavenworth - Underground Duct System (Contract HH-525)

All work on this contract was completed in accordance with contract plans and specifications on September 14, 1976.

E) McAllister Street - Divisadero to Leavenworth - Underground Duct System (Contract HH-526)

All work on this contract was completed in accordance with contract plans and specifications on November 24, 1976.

F) Ashbury, Fillmore, Church, 18th and Other Streets Underground Duct System (Contract HH-526)

All work on this contract was completed in accordance with contract plans and specifications on January 13, 1977.

G) K-Line, Ocean Avenue at Route 280 Overpass, Track Reconstruction and Power Facilities (Contract MR-620)

All work on this contract was completed in accordance with contract plans and specifications. Included was the construction of underground duct lines.

H) Ocean Avenue and Phelan Avenue Rechannelization and Track Reconstruction (DPW Contract 23,727)

Bids were received on August 4, 1976 for DPW Contract 23,727 for Ocean and Phelan Avenues Rechannelization, which includes relocation of trolley poles and the overhead trolley wire system and the undergrounding of feeder cables, along with Muni streetcar track relocation and rerailing. The contract was awarded on September 3, 1976 to Homer J. Olsen, Inc., Union City, California, who submitted the low bid of \$1,415,831. The amount bid for the PIP work included in the contract was \$63,962. The contract was certified by the City Controller on November 8, 1976. Construction commenced on November 10, 1976.

I) Judah Street - 20th to 48th Avenues - Underground Power Facilities (Contract HH-523)

Plans and specifications for construction of manholes and underground duct banks and the installation of feeder cables and related work were completed and transmitted to UMTA for approval on November 22, 1976. Included in the

contract to be funded under the Transit Improvement Program is the furnishing and installing of new trolley/streetlight poles and the furnishing and installing of new feed spans and related work. The plans and specifications were approved by UMTA on December 1, 1976. Bids were received on December 16, 1976. The contract was awarded on January 11, 1977 to L. K. Comstock & Company, Inc., San Francisco, California, who submitted the low bid of \$355,462. The contract was certified by the City Controller on February 8, 1977. Construction commenced on February 28, 1977.

J) Sutter, McAllister and Fillmore Streets - Underground Power Facilities and Related Work (Contract HH-540)

Plans and specifications for the installation of feeder cables in duct banks constructed under Contracts HH-525 and HH-526 were completed and transmitted to UMTA for approval on August 23, 1976. The plans and specifications were approved by UMTA on September 8, 1976. Bids were received on September 16, 1976. The contract was awarded on September 28, 1976 to Abbett Electric Corporation, San Francisco, California, who submitted the low bid of \$238,495. The contract was certified by the City Controller on October 14, 1976. Construction commenced on November 8, 1976.

K) J, N, No. 22 and 33 Lines, Underground Power Facilities (Contract HH-552)

Plans and specifications for installation of feeder cables in duct banks constructed under Contracts HH-497 and HH-527, and in existing duct banks in Carl and Irving Streets, were transmitted to UMTA for approval on March 2, 1977. Following approval by UMTA, bids were received on March 31, 1977. The contract was awarded on April 12, 1977 to Amelco Electric, San Francisco, California, who submitted the low bid of \$238,950. The contract was certified by the City Controller on May 5, 1977. Construction commenced on May 23, 1977.

L) Folsom and Howard Streets, Eleventh Street to Main Street Underground Duct System (Contract HH-559)

Plans and specifications for constructing manholes and underground duct banks in Folsom and Howard Streets between Eleventh and Main Streets were completed and transmitted to UMTA for approval on August 23, 1976. The plans and specifications were approved by UMTA on

September 8, 1976. Bids were received on September 16, 1976. The contract was awarded on September 28, 1976 to McGuire & Hester, Oakland, California, who submitted the low bid of \$629,735. The contract was certified by the City Controller on October 25, 1976. Construction commenced on November 15, 1976.

M) Haight Street - Stanyan to Gough - Underground Duct System (Contract HH-560)

Plans and specifications for constructing manholes and underground duct banks in Haight Street, between Stanyan and Gough, were completed and transmitted to UMTA for approval on February 4, 1977. The plans and specifications were approved by UMTA on February 25, 1977. Bids were received on March 10, 1977. The contract was awarded on March 22, 1977 to Underground Construction Co., Inc., San Leandro, California, who submitted the low bid of \$329,847. The contract was certified by the City Controller on April 7, 1977. Construction work commenced on May 2, 1977.

N) Fillmore, Jackson, Presidio and Other Streets Underground Duct System (Contract HH-561)

Plans and specifications for constructing manholes and underground duct banks in Fillmore, Jackson, Presidio and other streets were completed and transmitted to UMTA for approval on October 29, 1976. The plans and specifications were approved by UMTA on November 10, 1976. Bids were received on December 2, 1976. The contract was awarded on December 14, 1976 to W. R. Thomason, Inc., Martinez, California, who submitted the low bid of \$614,000. The contract was certified by the City Controller on January 11, 1977. Construction work commenced on January 31, 1977.

O) Fulton and McAllister Streets - 8th Avenue to Divisadero Street - Underground Duct System (Contract HH-562)

Plans and specifications for constructing manholes and underground duct banks in Fulton and McAllister Streets between 8th Avenue and Divisadero Street were transmitted to UMTA for approval on April 5, 1977. The plans and specifications were approved by UMTA on April 19, 1977. Bids were received on May 12, 1977. The contract was awarded on May 24, 1977 to Amalgamated Superior Engineering, Inc., Oakland, California, who submitted the low bid of \$312,275. The contract was certified by the City Controller on June 10, 1977, and the Contractor was notified of the starting date of July 5, 1977.

P) Folsom Street - 11th to 16th Streets and 11th Street
Market to Bryant - Underground Duct System
(Contract HH-563)

Plans and specifications for constructing manholes and underground duct banks in Folsom Street between 11th and 16th Streets and in 11th Street between Market and Bryant were completed and transmitted to UMTA for approval on September 10, 1976. The plans and specifications were approved by UMTA on September 28, 1976. Bids were received on October 14, 1976. The contract was awarded on October 26, 1976 to Underground Construction Co., Inc., San Leandro, California, who submitted the low bid of \$169,075. The contract was certified by the City Controller on November 17, 1976. Construction work commenced on December 13, 1976. All work on this contract was completed in accordance with contract plans and specifications on April 14, 1977.

Q) Hayes Street - Van Ness to Stanyan - Underground Duct
System (Contract HH-567)

Plans and specifications for constructing manholes and underground duct banks in Hayes Street between Van Ness Avenue and Stanyan Street were completed and transmitted to UMTA for approval on June 2, 1977. The plans and specifications were approved by UMTA on June 21, 1977. Bids are scheduled to be received on July 21, 1977.

R) Broad Street and San Jose Avenue, M-Line Track Extension
(Contract MR-644)

Plans and specifications for the PIP portion of work to be included in Municipal Railway Contract MR-644, Broad Street and San Jose Avenue, M-Line Track Extension, were completed and transmitted to TIP on April 8, 1977. The work to be included consists of construction of manholes and underground duct banks in San Jose Avenue and Broad Street, from Plymouth Avenue to Mt. Vernon Avenue. This work was formerly part of Contract HH-558. Advertising by TIP for receipt of bids for this contract is awaiting approval by UMTA of amendment to System Improvement Program (SIP).

S) Feeder Undergrounding - Folsom and Howard Streets
(Contract HH-448)

Work continued on the preparation of plans and specifications for the installation of feeder cables in underground duct banks constructed under other contracts.

- T) Ocean Avenue - Phelan Avenue to Outer Mission Substation
Underground Power Facilities and Related Work
(Contract HH-578)

Work commenced on the preparation of plans and specifications for the installation of feeder cables in duct banks constructed under DPW Contract 23,727 and Contracts MR-620 and HH-537. Also to be included in this contract will be the removal of overhead feeders on Ocean Avenue from Junipero Serra Boulevard to Mission Street and on San Jose Avenue between Ocean Avenue and Geneva Substation.

- U) Union, Parnassus and Clayton Streets - Underground Duct System (Contract HH-579)

- V) Bryant, 16th, Mission, South Van Ness and Other Streets
Underground Duct System (Contract HH-580)

- W) California Street - Parker to 32nd Avenue and 8th Avenue
California to Fulton - Underground Duct System
(Contract HH-581)

- X) San Jose Avenue - Mt. Vernon Avenue to Metro Center
M-Line Track Extension (Future Municipal Railway Contract)

Work commenced on the preparation of plans and specifications for constructing manholes and underground duct banks. Feeder cables will be installed in these duct banks under later contracts.

- Y) Other Work

Preliminary engineering and plans and specifications are proceeding for duct lines and feeder undergrounding in accordance with the requirements of the Program.

- Z) Manhole Frames and Covers (Third Contract)

Bids were received on July 16, 1976 for purchasing an additional 200 sets of manhole frames and covers for use on future Power Improvement Program contracts. The contract was awarded to Neenah Foundry Company, Neenah, Wisconsin, who submitted the low bid of \$68,000. Delivery of the frames and covers was completed on February 28, 1977.

8. Transit Preferential Street Program: Mission Street and
Fourth Street, Muni Passenger Platforms and Muni Power
Facilities (DPW Contract 23,834)

Advertising of Department of Public Works (DPW) Contract No. 23,834, Transit Preferential Street Program: Mission

Street, Beale to South Van Ness Avenue; and Fourth Street, Market to Townsend, which includes the relocation of trolley coach overhead facilities, is awaiting scheduling by the Department of Public Works.

9. Miscellaneous

- A) Coordination meetings of the joint staffs of Transit Improvement Program and the Power Improvement Program were held.
- B) Coordination meetings were held between Hetch Hetchy staff and the Consultants on the electrification, substation and control and communication projects.

BUREAU OF LIGHT, HEAT AND POWER

STREET LIGHTING

General

The lighting of public streets within the City of San Francisco is provided by facilities which are, on a City-wide basis, 44.0 percent owned by the City; 54.2 percent owned by the Pacific Gas and Electric Company; and a small percentage, 1.8 percent, jointly owned. In the underground areas, where the economic advantage of City ownership is greatest, 82.4 percent of the lights are City-owned. Five years ago, the corresponding figure was 78.3 percent.

In fiscal year 1933-34, the cost for street lighting was \$1.25 per capita; last year, with approximately thirty times as much light on the streets and public thoroughfares, the cost per capita was approximately \$2.18.

Maintenance and repair of City-owned installations was performed under two contracts. One provided for group replacement of lamps in accordance with schedules developed by the Bureau. A second contract covered work required for repair of damages and defective equipment, painting and miscellaneous maintenance.

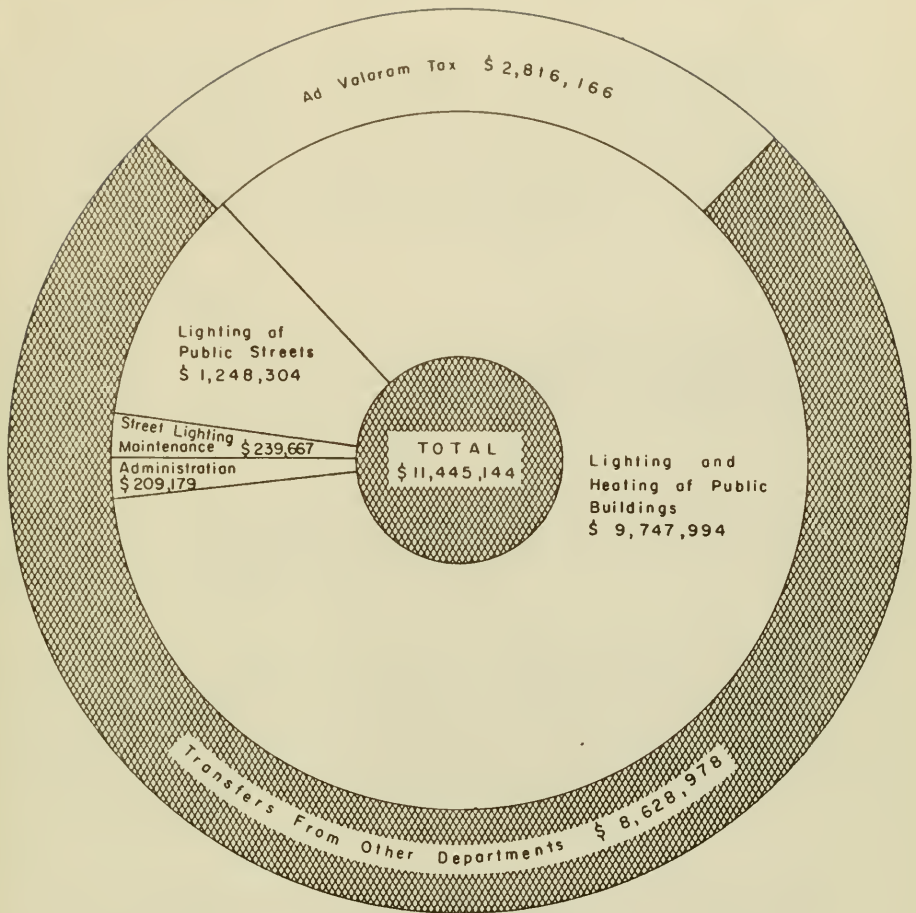
Under contract, the Pacific Gas and Electric Company furnished street lighting service as directed, including the furnishing, maintenance and operation of Company-owned facilities. Certain services were provided also for City-owned facilities, including switching and control, replacement of individual lamps and globes, and emergency work required during other than normal working hours.

Electric energy for all City and Company-owned streetlight operation was supplied by the Hetch Hetchy power system.

NEW STREETLIGHTS ON

BOSWORTH STREET





BUREAU OF LIGHT, HEAT & POWER
REVENUES AND EXPENDITURES
FISCAL YEAR 1976-1977



Engineering

The Bureau reviews, recommends changes, approvals or rejections of, and correlates all street lighting installations, including that done by the Department of Public Works, the Pacific Gas and Electric Company, the State of California, subdividers, etc.

During the fiscal year 1976-77, 14 street lighting contracts, involving a total of 664 new streetlights, were approved by the Public Utilities Commission. Plans were submitted for approval only after careful checking to determine that illumination will exceed the minimum requirements established by the American National Standards Institute; and that all materials used, and manner of installation, meet with the applicable local, state and federal rules, regulations and statutes governing the installation of electrical works.

Operation and Maintenance

As of June 30, 1977, a total of 37,446 City-owned and Company-owned streetlights were in service to the public streets, parks, viaducts, overcrossings, tunnels and underpasses. A summary of the number and type of units in service, at the end of the fiscal year, is shown in Appendix Table 14.

A total of \$1,524,286 was expended for operation, maintenance, and repair of the street lighting system. Of the total cost, \$18,773 was paid by the State for its share of the operation and maintenance of street lighting at intersections on City streets, which are part of the State Highway system.

During the fiscal year, there were 127 accidents involving damage to City-owned street lighting property. Investigation was made, as soon as possible, to remove hazards to the public and obstructions to traffic. Total cost of repairs to damaged City-owned street lighting property was \$104,000. Every effort was made to secure reimbursement for damages incurred from responsible parties. Previous experience indicates that more than half of the repair costs will be recovered.

Complaints

During the year, 40 complaints requiring field investigation were received and acted upon. These complaints concerned inadequate illumination, objectionable glare in windows, and requests for temporary and permanent relocation of street lighting poles.

Improvements

During the fiscal year 1976-77, a total of 691 new City-owned streetlights were placed in service at a cost of \$1,184,878. Improvements were financed by State Gasoline Tax and the 1964 and 1972 Street Lighting Bond Issue as indicated in Appendix Tables 16 and 17.

UTILITY SERVICES TO MUNICIPAL DEPARTMENTS

General

Electric energy supplied to municipal departments is generated on the Hetch Hetchy power system and delivered to various service points by transmission and distribution facilities of Pacific Gas and Electric Company under a wheeling contract. Natural gas supplied to municipal departments is furnished by the Pacific Gas and Electric Company under a service contract.

Municipal Consumption of Electricity and Gas

During the fiscal year, 496,305,458 kilowatthours of electrical energy were consumed through 1,072 municipal accounts at an expenditure of \$6,966,586. Of the above, 152,161,432 kilowatt-hours of energy were supplied to the San Francisco International Airport for resale to tenants. Natural gas consumption was 17,174,388 therms through 560 accounts at a cost of \$3,321,758.

There were several increases in gas rates last year which increased the cost to municipal accounts by approximately \$629,868. The average cost per therm increased by approximately 28 percent.

A summary of consumption and expenditures for these commodities is shown in Tables 12 and 13.



HOWARD P. GRANT

PEOPLE AT WORK



JACK O'ROURKE



JOE F. DE GRACA



EVERETT M. HINTZE & KEVIN R. WALSH

A P P E N D I X



HETCH HETCHY RESERVOIR

Hetch Hetchy Reservoir, which provides a water supply for almost 2,000,000 people in the Bay Area, is shown here at its lowest point during the drought...at 6.8 percent of capacity.

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TABLE 1

HETCH HETCHY WATER AND POWER

SUMMARY OF RECEIPTS, EXPENDITURES AND TAXES

FISCAL YEAR 1976-77

<u>RECEIPTS</u>	<u>Budget</u>	<u>Actual</u>	<u>-Under, Over</u>
Revenue from Sale of Electrical Energy	\$ 40,933,000	\$ 43,341,973	\$ 2,408,973
Revenue from Sale of Water and Standby Charge, SFWD	8,000,000	8,000,000	
Other Revenue	<u>100,000</u>	<u>124,451</u>	<u>\$ 24,451</u>
Total Revenue	<u>\$ 49,033,000</u>	<u>\$ 51,466,424</u>	<u>\$ 2,433,424</u>
<u>EXPENDITURES</u>			
Total Expenditures	<u>\$ 56,670,959</u>	<u>\$ 55,970,922</u>	<u>\$ -700,037</u>
<u>TAXES</u>			
<u>Tax Levying Entity</u>	<u>No. of Bills</u>	<u>Assessed Values</u>	<u>Total Amount of Taxes</u>
Alameda County	10	\$ 2,450.00	\$ 292.76
San Joaquin County	12	45,375.00	4,481.18
San Mateo County	16	3,900.00	361.36
Stanislaus County	79	124,310.00	12,602.74
Tuolumne County	42	6,105,311.00	559,936.46
Banta-Carbona Irrigation Dist.	1	3,642.28	156.62
Oakdale Irrigation Dist.	4	25,897.00	535.94
West Stanislaus Irrigation Dist.	<u>1</u>	<u>4,250.00</u>	<u>153.00</u>
Total	<u>165</u>	<u>\$ 6,315,135.28</u>	<u>\$ 578,520.06</u>

TABLE 2
HETCH HETCHY WATER AND POWER*

COMPARISON OF BUDGETED AND ACTUAL EXPENDITURES (INCLUDING ENCUMBRANCES)
FISCAL YEAR 1976-77

OE	DESCRIPTION	BUDGET	ACTUAL	-UNDER, OVER
110	Permanent Salaries	\$ 823,518	\$ 785,429	\$ -38,089
110-1	Permanent Salaries - Crafts	1,219,893	1,087,895	-131,998
111	Overtime	15,000	10,804	-4,196
11-1	Overtime - Crafts	121,539	73,888	-47,651
112	Holiday Pay	2,200	2,181	-19
112-1	Holiday Pay - Crafts	2,282	2,282	-
113	Extended Workweek	3,869	3,439	-430
113-1	Extended Workweek - Crafts	10,460	13,603	3,143
120	Temporary Salaries	55,000	30,441	-24,559
120-1	Temporary Salaries - Crafts	192,000	143,217	-48,783
139	Permanent Salaries - Gardeners	54,653	54,653	-
200	Contractual Services	101,745	94,218	-7,527
216	Maint. and Repair of Auto Equipment	10,209	8,422	-1,787
231-1	Purchase of Power for Resale	34,007,000	33,921,500	-85,500
231-2	Service Charge for Transm. and Dist.	2,515,000	2,568,255	53,255
251	Subsistence of Employees	4,000	1,944	-2,056
300	Materials and Supplies	192,202	232,597	40,395
640	Water Rights and Damage Claims	5,000	944	-4,056
641	Hydrography	49,800	47,909	-1,891
801	Accident Compensation	45,335	45,335	-
804	Claims	500	4,420	3,920
812	Fidelity Insurance	82	82	-
813	Automobile Insurance	10,599	10,599	-
814	Fire Insurance	8,297	26,439	18,142
815	Miscellaneous Insurance	39,007	39,007	-
853	Assessments	51,091	51,091	-
854	Membership Dues	300	366	66
855	Watershed Protection	20,000	20,000	-
855	Fee to U.S. Gov't - Raker Act	30,000	30,000	-
856	Maint. of Roads - Raker Act	15,000	15,000	-
860	Retirement Allowances	589,119	437,612	-151,507
862	Social Security	140,037	135,831	-4,206
865	Health Service System	77,872	71,665	-6,207
870	Taxes	578,520	578,520	-
880	Rental - Transm. Lines and Offices	116,400	114,733	-1,667
900	Services of Other Departments	982,047	969,176	-12,871
	TOTAL OPERATION AND MAINTENANCE	\$42,089,576	\$41,633,497	-456,079
400	Equipment	106,825	104,850	-1,975
500	Additions and Betterments	221,000	221,000	-
700	Reconstruction and Replacement	1,978,035	1,978,035	-
830	Bond Interest and Redemption	8,603,660	8,603,660	-
	TOTAL	\$52,999,096	\$52,541,042	-458,054

* Does not include Transit Power Division - Table 4 or Bureau of Light, Heat and Power - Table 11.

TABLE 3

TRANSIT POWER DIVISION

MOTIVE POWER SECTION - SUBSTATIONS

Substation	Type (a)	Date Installed	No. of Units	KW Size	Fiscal Year 1976-77	
					Max. Load in KW	KWH Converted to 600 V dc
Bryant	M-G	1910	3	1500	2308	8,250,350
	M-G	1910	(b) 2	1500	0	0
Turk	M-G	1910	3	1500	4501	9,516,400
	M-G	1910	(b) 2	1500	0	0
Downtown	SC	1921	2	2000	3480	8,859,000
	SC	1924	1	3000		
Eighth Avenue	SC	(c) 1921	1	1500	1406	3,292,000
	SC	(c) 1921	(b) 1	1500	0	0
	SC	1924	1	2000		
	SR	1951	1	2000	2375	6,634,000
Outer Mission	MAR	1953	1	750	875	2,694,000
Geneva	M-G	1910	3	1500	1395	19,400
Civic Center	SR	1976	2	4000	825	1,209,600
Church	SR	1977	2	4000	595	528,000
Judah	SR	1977	1	4000	346	153,600
						41,156,350

Notes: (a) Type of Conversion Equipment: M-G = Motor-Generator SC = Synchronous Converter MAR = Mercury Arc Rectifier SR = Silicon Rectifier

(b) Indicates units that are not serviceable. Units have not been repaired because of the high cost and because they are not needed to carry the present load. Also, it is planned to replace the conversion equipment with modern silicon rectifiers in the near future.

(c) Units were originally installed at Washington and Mason in 1914 and were moved to Eighth Avenue in 1921.

TABLE 4

HETCH HETCHY WATER AND POWER

TRANSIT POWER DIVISION

COMPARISON OF BUDGETED AND ACTUAL EXPENDITURES
(INCLUDING ENCUMBRANCES)

FISCAL YEAR 1976-77

<u>OE</u>	<u>DESCRIPTION</u>	<u>BUDGET</u>	<u>ACTUAL</u>	<u>-UNDER OVER</u>
110	Permanent Salaries	\$ 68,425	\$ 34,548	\$ -33,877
110-1	Permanent Salaries - Crafts	840,522	750,385	-90,137
111-1	Overtime - Crafts	91,398	99,651	8,253
112-1	Holiday Pay - Crafts	8,851	8,718	-133
113-1	Extended Work Week - Crafts	43,080	25,943	-17,137
120-1	Temporary Salaries - Crafts	8,000	9,071	1,071
200	Contractual Services	10,626	4,092	-6,534
300	Materials and Supplies	57,798	27,118	-30,680
800	Accident Compensation	20,665	20,665	
860	Retirement Allowances	266,830	199,471	-67,359
862	Social Security	48,672	47,205	-1,467
865	Health Service System	28,708	26,425	-2,283
900	Services of Other Departments	<u>175,113</u>	<u>173,413</u>	<u>-1,700</u>
	TOTAL OPERATION AND MAINTENANCE	\$ 1,668,688	\$ 1,426,705	\$ -241,983
400	Equipment	3,175	3,175	
700	Reconstruction and Replacements	<u>2,000,000</u>	<u>2,000,000</u>	
	TOTAL	<u>\$ 3,671,863</u>	<u>\$ 3,429,880</u>	<u>\$ -241,983</u>

TABLE 5
HETCH HETCHY WATER AND POWER

CONSTRUCTION CONTRACTS
FISCAL YEAR 1976-77

Contract No.	Description	Contractor	Contract Time Started	Contract Time Completed	Original Contract Price	Value of Work Done During Fiscal Year
HH-494	Replace, Repair and Paint Trolley Poles on Fulton, La Playa and Mission Streets	Mahoney Electric Co. Inc.	11-10-75	9-15-76	185,246	13,284
HH-503	Taraval Street, and 46th Avenue 20th Avenue to Vicente Street Underground Duct System	Peter Kiewit Sons' Co.	3-29-76	10-8-76	246,200	114,718
HH-517	K Line - Transit Power Facilities Street Lighting and Related Work	Amelco Electric	5-24-76	-	132,865	132,891
HH-521	Market Street Subway Electrification Embarcadero Station to Duboce Portal	Amelco Electric	7-14-75	-	1,077,000	97,680
HH-522	Civic Center, Church and Downtown Substations, Installation of Electrical Equipment	De Narde Construction Co.	10-6-75	-	652,990	291,159
HH-523	Judah Street, 20th to 48th Avenues Underground Power Facilities	L. K. Comstock & Co. Inc.	2-28-77	-	355,462	130,189
HH-524	K Line Streetcar Overhead System Conversion for Pantograph Operation	Amelco Electric	2-21-77	-	239,000	0
HH-525	Sutter Street, Presidio Avenue to Leavenworth Street Underground Duct System	R. Flatland Co.	1-26-76	9-7-76	372,835	8,450

TABLE 5 (Cont'd)

Contract No.	Description	Contractor	Contract Time Started	Contract Time Completed	Original Contract Price	Value of Work Done During Fiscal Year
HH-526	McAllister Street, Divisadero Street to Leavenworth Street, Underground Duct System	R. Flatland Co.	6-1-76	11-24-76	248,430	203,760
HH-527	Ashbury, Fillmore, Church, 18th and Other Streets, Underground Duct System	Lowrie Paving Co. Inc.	6-28-76	1-13-77	367,999	353,388
HH-528	Laguna Honda and Judah Substations Construct Buildings and Install Equipment	Herrero Brothers Inc.	3-29-76	-	567,913	298,109
HH-529	Carl Street Substation, Construct Building and Install Equipment	S. J. Amoroso Construction Co., Inc.	7-19-76	-	597,800	411,200
HH-531	Market Street Subway Electrification Duboce Junction to Eureka Station	Amelco Electric	6-26-77	-	195,428	174,519
HH-536	Streetcar Overhead System, West Portal Avenue, Conversion for Pantograph Operation and Related Street Lighting Work	Mahoney Electric Co., Inc.	11-8-76	-	295,671	138,773
HH-539	Van Ness Avenue, Market Street to North Point Street, Repair and Paint Trolley and Street Lighting Poles	Louis Khan Painting	7-6-76	2-25-77	39,893	39,893
HH-540	Sutter, McAllister and Fillmore Streets, Underground Power Facilities and Related Work	Abbett Electric Corporation	11-8-76	-	238,495	188,162

TABLE 5 (Cont'd)

<u>Contract No.</u>	<u>Description</u>	<u>Contractor</u>	<u>Contract Time Started</u>	<u>Contract Time Completed</u>	<u>Original Contract Price</u>	<u>Value of Work Done During Fiscal Year</u>
HH-541	Paint Steel Towers, Moccasin Newark Transmission Line	Frank Brown Painting Contractor	7-6-76	8-25-76	56,260	50,522
HH-543	Repair and Reroof Hetch Hetchy Buildings, Moccasin and Early Intake	Western Roofing Service	10-4-76	-	48,664	48,334
HH-544	Fillmore Substation, Construct Building and Install Equipment	Herrero Brothers, Inc.	9-13-76	-	651,840	541,220
HH-546	Randolph Substation, Construct Building and Install Equipment	Kaplan-Jones Joint Venture	3-3-77	-	226,900	83,371
HH-547	San Jose Substation, Install Equipment	L. K. Comstock & Co. Inc.	2-28-77	-	84,790	3,392
HH-548	Taraval Substation, Construct Building and Install Equipment	Joseph Di Giorgio & Sons, Inc.	4-18-77	-	253,950	23,457
HH-552	J, N, No. 22 and No. 33 Lines Underground Power Facilities and Related Work	Amelco Electric	5-23-77	-	238,950	6,445
HH-553	Replace, Repair and Paint Steel Trolley Poles on Mission Street	Mahoney Electric Co., Inc.	12-6-76	-	89,984	63,580
HH-554	Construction of No. 47 Trolley Coach Loop at Army Street	Mahoney Electric Co., Inc.	10-15-76	-	31,110	27,949
HH-555	Red Mountain Bar, Surge Shaft Cover	National Bridge Co.	6-13-77	-	23,800	0

TABLE 5 (Cont'd)

Contract No.	Description	Contractor	Contract Started	Contract Time Completed	Original Contract Price	Value of Work Done During Fiscal Year
HH-556	Construction of Claribel Lateral Timber Bridge	H. Max Lee, Inc.	6-26-76	10-23-76	4,990	4,990
HH-557	Paint Steel Trolley Poles, Various Locations	Giampolini and Co.	3-27-77	-	37,200	13,307
HH-559	Howard and Folsom Streets, Eleventh Street to Main Street, Underground Duct System	McGuire and Hester	9-28-77	-	629,735	379,375
HH-560	Haight Street, Stanyan to Gough Underground Duct System	Underground Construction Co., Inc.	5-2-77	-	329,847	110,632
HH-561	Fillmore, Jackson, Presidio and Other Streets, Underground Duct System	W. R. Thomason, Inc.	1-31-77	-	614,000	518,868
HH-563	Folsom Street, 11th to 16th and Eleventh Street, Mission to Bryant Underground Duct System	Underground Construction Co., Inc.	12-13-76	4-14-77	169,075	160,400
HH-564	Moccasin and Tesla Portal Buildings Exterior Repair, Painting and Roof Preservative	Ross F. Porter	12-13-76	-	50,400	54,846
HH-565	Lower Cherry Aqueduct Rehabilitation	Chas. I. Cunningham Co.	9-7-76	10-30-76	65,933	54,083
Total Amount of Hetch Hetchy Contract Work Performed During Fiscal Year						\$4,740,946

TABLE 6
HETCH HETCHY WATER SUPPLY

PRECIPITATION, RUNOFF, STORAGE AND DELIVERY						
AS OF JUNE 30 BY FISCAL YEARS						
SEASON PRECIPITATION (INCHES)	Normal	1972-73	1973-74	1974-75	1975-76	1976-77
Hetch Hetchy	34.27	35.97	38.46	39.15	21.80	18.53
Lake Lloyd	46.92	46.03	57.45	47.86	24.91	21.10
Approx. Percent of Normal	100%	102%	112%	107%	58%	50%
WATERSHED RUNOFF (ACRE-FT.) (a)						
Hetch Hetchy	726,098	780,799	871,240	769,239	376,347	210,851
Lake Lloyd)	424,759	444,358	533,923	450,131	229,041	123,372
Lake Eleanor)						
Total	1,150,857	1,225,157	1,405,163	1,219,370	605,388	334,223
Approx. Percent of Normal		106%	121%	105%	52%	29%
RESERVOIR STORAGE (ACRE-FT.) (a)						
	No Spill					
	Capacity					
Hetch Hetchy	360,360	362,736	360,163	327,963	201,576	154,040
Lake Lloyd	268,800	217,872	268,284	239,909	154,439	135,507
Lake Eleanor	27,100	27,016	26,726	26,823	2,563	1,043
Total	656,260	607,624	655,173	594,695	358,578	290,590
DELIVERY TO SFWD (ACRE-FT.) (a) (b) (c)						
Average per day		585	532	675	588	747
Maximum per day		856	850	925	934	944
Total for fiscal year		213,684	193,518	246,514	215,726	273,450

NOTES: (a) One acre-foot equals 325,900 gallons or approximately 1/3 million gallons.
 (b) Includes delivery to Livermore site, U.S. Atomic Energy Commission.
 (c) Total since operation of Hetch Hetchy Aqueduct began in 1934: 5,074,170 acre-feet.

TABLE 7
HETCH HETCHY POWER SYSTEM

ELECTRIC ENERGY GENERATED, PURCHASED, AND DISTRIBUTED
FISCAL YEAR 1976-77

<u>PLANT DATA</u>	<u>Nameplate Rating (Kilowatts)</u>	<u>Capability (Kilowatts)</u>	<u>Annual Plant Factor - %</u>
Moccasin Powerhouse	90,000	104,000	41.9
Dion R. Holm Powerhouse	135,000	150,000	11.5
Robert C. Kirkwood Powerhouse	67,500	85,000	41.3
Total	292,500	339,000	
<u>ENERGY GENERATED AND PURCHASED (KILOWATT-HOURS)</u>			
<u>Gross Generation</u>			
Moccasin Powerhouse		330,510,000	
Dion R. Holm Powerhouse		135,416,000	
Robert C. Kirkwood Powerhouse		244,076,000	710,002,000
<u>Station Service</u>			
Moccasin Powerhouse		853,800	
Dion R. Holm Powerhouse		499,290	
Robert C. Kirkwood Powerhouse		451,590	1,804,680
<u>Net Generation</u>			708,197,320
<u>Supplementary Energy</u>			
"Bank" Withdrawal*		0	
Purchase (PGandE)		1,468,919,029	1,468,919,029
<u>Total</u>			<u>2,177,116,349</u>
<u>ENERGY DISTRIBUTED (KILOWATT-HOURS)</u>			
<u>Sales</u>			
Municipal Accounts		499,833,145	
Modesto Irrigation District		1,013,509,726	
Turlock Irrigation District		591,956,719	
Kaiser Cement and Gypsum Corp.		0	
Kaiser Aluminum and Chemical Corp.		0	
Norris Industries, Inc.		2,058,278	
Lockheed Missiles and Space Co. Inc.		0	
General Motors Corporation		0	
I B M Corporation		0	
Liquid Air, Inc.		0	
Miscellaneous Customers		824,292	2,108,182,160
<u>Non-Revenue</u>			
Project Use		2,965,669	
"Bank" Deposit*		0	2,965,669
<u>Losses</u>			
Hetch Hetchy System		36,002,634	
PGandE System (Municipal Accounts)		29,965,886	65,968,520
<u>Total</u>			<u>2,177,116,349</u>

* In accordance with letter-agreement between City and PGandE dated 6/24/75

TABLE 8

HETCH HETCHY POWER SYSTEMCOMPARATIVE ELECTRIC ENERGY SALES TO CUSTOMERSFISCAL YEARS 1975-76 AND 1976-77

(Nearest 100,000 Kilowatthours)

<u>CUSTOMER</u>	<u>1975-76</u>	<u>1976-77</u>
Municipal Accounts		
International Airport	189,200,000	195,200,000
Municipal Railway	56,900,000	62,300,000
Public Works	26,800,000	26,000,000
Street Lighting	46,400,000	46,000,000
Unified School District	39,700,000	39,100,000
Water Department	48,400,000	44,900,000
Other City Departments	82,800,000	86,300,000
Modesto Irrigation District	865,100,000	1,013,500,000
Turlock Irrigation District	248,800,000	592,000,000
Kaiser Cement and Gypsum Corp.	78,400,000	0
Kaiser Aluminum and Chemical Corp.	11,300,000	0
Norris Industries, Inc.	7,200,000	2,100,000
Lockheed Missiles & Space Co., Inc.	80,200,000	0
General Motors Corporation	28,800,000	0
I B M Corporation	25,800,000	0
Liquid Air, Inc.	12,500,000	0
Miscellaneous Customers	<u>900,000</u>	<u>800,000</u>
TOTAL	<u>1,849,200,000</u>	<u>2,108,200,000</u>

TABLE 9

HETCH HETCHY POWER SYSTEM

COMPARATIVE GROSS REVENUE RECEIVED FROM SALE OF ELECTRIC ENERGY
FISCAL YEARS 1975-76 AND 1976-77
 (Nearest \$1,000)

<u>CUSTOMER</u>	<u>1975-76</u>	<u>1976-77</u>
Municipal Accounts		
International Airport	\$ 2,542,000	\$ 3,081,000
Municipal Railway	649,000	781,000
Public Works	330,000	359,000
Street Lighting	517,000	559,000
Unified School District	553,000	612,000
Water Department	476,000	509,000
Other City Departments	1,011,000	1,126,000
Modesto Irrigation District	7,457,000	20,982,000*
Turlock Irrigation District	2,283,000	12,484,000*
Kaiser Cement and Gypsum Corp.	1,318,000	124,000
Kaiser Aluminum and Chemical Corp.	220,000	35,000
Norris Industries, Inc.	164,000	32,000*
Lockheed Missiles & Space Co., Inc.	1,454,000	134,000
General Motors Corporation	572,000	37,000
I B M Corporation	478,000	60,000
Liquid Air, Inc.	190,000	17,000
Miscellaneous Customers	10,000	10,000
	<u>\$ 20,224,000</u>	<u>\$ 40,942,000</u>
TOTAL		

* Indicates amount as paid by customer

TABLE 10

HETCH HETCHY POWER SYSTEM
ELECTRIC ENERGY GENERATED, PURCHASED, AND DISTRIBUTED BY FISCAL YEARS --- KILOWATT-HOURS

NET GENERATION	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77
Moccasin Powerhouse	533,978,200	542,886,200	554,418,600	539,122,000	459,718,300	329,656,200
Dion R. Holm Powerhouse	808,515,430	653,141,570	818,867,290	875,047,560	655,980,250	134,916,710
Robert C. Kirkwood Powerhouse	614,151,930	601,147,890	616,788,400	640,097,630	522,119,850	243,624,410
Subtotal	1,956,645,560	1,797,175,660	1,990,074,290	2,054,267,190	1,637,818,400	708,197,320
SUPPLEMENTAL ENERGY						
"Bank" Withdrawal*	46,360,466	0	36,435,281	123,458,969	36,545,220	0
Purchase (PG&E)	108,734,434	351,288,448	44,401,773	0	247,922,311	1,468,919,029
Subtotal	155,094,900	351,288,448	80,837,054	123,458,969	284,467,531	1,468,919,029
TOTAL	2,111,740,460	2,148,464,108	2,070,911,344	2,177,726,159	1,922,285,931	2,177,116,349
DISTRIBUTION						
Sales						
Municipal Accounts	478,105,789	508,259,909	482,482,697	481,275,895	490,203,242	499,833,145
Modesto Irrigation Dist.	796,740,000	858,816,000	787,392,000	734,880,000	865,104,000	1,013,509,726
Turlock Irrigation Dist.	360,619,200	421,484,000	302,784,000	219,120,000	248,817,883	591,956,719
Kaiser Cement & Gypsum	152,127,205	145,368,000	156,720,000	143,688,000	78,351,659	0
Kaiser Aluminum & Chemical	33,996,000	31,521,600	31,320,000	28,137,600	11,280,000	0
Norris Industries, Inc.	17,664,768	22,325,760	22,502,016	21,695,155	7,167,744	2,058,278
Hercules, Inc.	57,906,000	---	---	---	---	---
California Ammonia Co.	80,876,760	---	---	---	---	---
Air Products & Chemicals	---	---	---	---	---	---
Valley Nitrogen Producers	---	---	---	---	---	---
Lockheed Missiles	---	---	39,556,800	209,304,000	80,177,458	0
General Motors	---	---	---	75,978,000	28,837,778	0
IBM Corporation	---	---	---	82,047,387	25,761,600	0
Liquid Air, Inc.	---	---	---	28,139,425	12,547,200	0
Miscellaneous Customers	759,065	847,858	733,633	809,002	920,851	824,292
Non-Revenue						
Project Use	4,287,512	4,003,796	3,266,691	3,264,541	3,277,963	2,965,669
"Bank Deposit"†‡	9,756,928	28,985,698	130,908,552	33,771,707	2,773,513	0
Losses	118,901,233	126,851,487	113,244,955	115,615,447	67,065,040	65,968,520
TOTAL	2,111,740,460	2,148,464,108	2,070,911,344	2,177,726,159	1,922,285,931	2,177,116,349

* In accordance with letter-agreement between City and PG&E dated June 24, 1975.

TABLE 11
BUREAU OF LIGHT, HEAT AND POWER

COMPARISON OF BUDGETED AND ACTUAL EXPENDITURES AND RECEIPTS
(INCLUDING ENCUMBRANCES)

FISCAL YEAR 1976-77

<u>OE</u>	<u>DESCRIPTION</u>	<u>BUDGET</u>	<u>ACTUAL</u>	<u>-UNDER +OVER</u>
<u>EXPENDITURES</u>				
110	Permanent Salaries	\$ 181,225	\$ 153,913	\$ -27,312
111	Overtime	538	538	0
112	Holiday Pay	537	0	-537
200	Contractual Services	1,284	1,338	+54
231	Lighting and Heating of Public Buildings - General	2,372,380	2,617,266	+244,886
231-1	Lighting and Heating of Public Buildings - Special Fund	7,440,009	7,130,728	-309,281
231-2	Lighting of Public Streets - Pacific Gas and Electric Co.	695,380	706,554	+11,174
231-3	Lighting of Public Streets - Hetch Hetchy	507,620	540,350	+32,730
231-4	Lighting of Public Streets - Calif. Division of Highways	1,400	1,400	0
300	Materials and Supplies	500	499	-1
400	Equipment	1,700	1,507	-193
813	Auto Insurance	257	257	0
860	Retirement Allowance	33,408	28,459	-4,949
862	Social Security	8,205	5,757	-2,448
865	Health Service System	6,407	4,911	-1,496
954	EDP - PUC Data Processing	12,000	12,000	0
TOTAL		<u>\$11,262,850</u>	<u>\$11,205,477</u>	<u>\$ -57,373</u>

RECEIPTS

Interfund Receipts*	\$ 8,718,076	\$ 8,389,311	\$-328,765
Ad Valorem Taxes	<u>2,544,774</u>	<u>2,816,166</u>	<u>+271,392</u>
TOTAL	<u>\$11,262,850</u>	<u>\$11,205,477</u>	<u>\$ -57,373</u>

WORK ORDER APPROPRIATIONS FROM ROAD FUND

<u>DESCRIPTION</u>	<u>TOTAL FUNDS</u>	<u>EXPENDITURE</u>	<u>-UNDER +OVER</u>
Maintenance and Repair of Street Lighting Installations	\$ 238,372	\$ 239,667	\$ +1,295

* Transfers from other Departments.

TABLE 12
BUREAU OF LIGHT, HEAT AND POWER
EXPENDITURE FOR ELECTRICITY FOR MUNICIPAL PURPOSES
FISCAL YEAR 1976-77

<u>DEPARTMENT</u>	<u>NO. OF ACCOUNTS</u>	<u>CONSUMPTION KILOWATT-HOUR</u>	<u>EXPENDITURES</u>
Art Commission (a)	3	38,320	792
Art Museum	2	1,248,640	15,938
Auditorium and Brooks Hall	1	4,917,000	66,933
Child Care Centers	12	268,067	5,391
City Demonstration Agency	1	170,720	2,925
City Planning	1	80,660	1,440
De Young Museum	1	3,059,200	36,573
Disaster Corp.	1	117	1,711
Electricity	5	844,218	11,051
Farmer's Market	1	25,706	520
Fire	59	2,993,742	54,644
Hassler Health Home	1	133,000	2,375
Health	43	29,520,323	299,786
Hetch Hetchy	6	128,975	2,728
Hidden Valley Ranch	1	827,040	11,485
International Airport (b)	18	195,244,022	3,081,124
Junior College District	26	7,746,837	100,695
Juvenile Hall	3	1,397,914	16,825
Legion of Honor	1	533,600	7,839
Library	31	2,444,828	39,228
Log Cabin Ranch	13	307,759	6,427
Municipal Railway	75	62,282,949	780,500
Parking Authority	18	179,171	3,672
Police	15	828,646	14,904
Public Buildings	14	15,301,621	168,256
Public Works	111	25,712,986	353,696
Purchasing	5	533,334	7,697
Real Estate	5	245,248	5,341
Recreation and Park	208	9,997,703	167,708
Recreation and Park - Candlestick Park	3	2,078,538	66,212
Recreation and Park - Yacht Harbor	32	1,153,833	21,859
Sheriff	3	1,429,560	16,374
Social Services	5	854,272	11,812
Street Lighting Operations (.003)	1	45,976,235	540,350
Unified School District	219	31,373,067	510,535
War Memorial	2	1,525,360	22,057
Water	126	44,882,247	509,183
TOTAL MUNICIPAL DEPARTMENTS	1,072	496,305,458	6,966,586
Academy of Sciences	2	3,212,291	36,343
State of California: Street Lighting	1	(c)	18,773
Traffic Devices	1	315,396	5,596
GRAND TOTAL FROM HETCH HETCHY	1,076	499,833,145	7,027,298

Notes: (a) New Account.
(b) Including 152,161,432 KWH resold at commercial rates for \$2,682,816 to Airport tenants.
(c) Included under Street Lighting Operations.

TABLE 13

BUREAU OF LIGHT, HEAT AND POWER

EXPENDITURE FOR GAS FOR MUNICIPAL PURPOSES

FISCAL YEAR 1976-1977

NATURAL GAS

<u>DEPARTMENT</u>	<u>NO. OF ACCOUNTS</u>	<u>CONSUMPTION THERMS</u>	<u>EXPENDITURES</u>
Art Commission (a)	2	3,398	680
Auditorium and Brooks Hall	2	1,007	197
Child Care Centers	11	30,156	5,723
City Demonstration Agency	1	9,539	1,878
City Planning	1	4,551	883
De Young Museum	1	238,287	46,149
Electricity	2	38,560	7,566
Farmer's Market	1	335	70
Fire	54	441,321	85,108
Hassler Health Home	3	1,443	293
Health	34	6,011,678	1,141,123
Hetch Hetchy	2	1,730	341
International Airport	5	1,444,270	278,861
Junior College District	17	606,221	116,916
Juvenile Hall	4	404,798	78,562
Legion of Honor	1	49,483	9,685
Library	28	93,808	18,256
Municipal Railway	14	264,005	54,733
Police	11	40,994	7,925
Public Buildings	5	1,233,393	239,823
Public Works	15	284,860	59,913
Purchasing	3	42,173	8,242
Real Estate	3	4,203	762
Recreation and Park	105	1,118,168	216,320
Recreation and Park - Candlestick Park	1	94,716	18,366
Registrar of Voters	1	2,934	557
Sheriff	3	438,175	84,274
Single Men's Rehabilitation	1	15,179	2,758
Social Services	4	48,849	9,532
Unified School District	211	3,832,147	752,904
War Memorial	3	235,392	46,277
Water	<u>11</u>	<u>138,615</u>	<u>27,081</u>
TOTAL MUNICIPAL DEPARTMENTS	560	17,174,388	3,321,758

Note: (a) New Account

TABLE 14
BUREAU OF LIGHT, HEAT AND POWER
STREETLIGHTS IN SERVICE
JUNE 30, 1977

<u>SIZE & TYPE OF LAMP</u>	<u>COMPANY-- OWNED</u>	<u>JOINTLY-- OWNED</u>	<u>CITY-- OWNED</u>	<u>TOTAL</u>
<u>UNDERGROUND CONNECTION</u>				
<u>High Voltage Series Circuit</u>				
1,000-Lumen Incandescent	---	22	---	22
2,500-Lumen Incandescent	245	24	62	331
4,000-Lumen Incandescent	937	122	1,065	2,124
6,000-Lumen Incandescent	571	449	2,455	3,475
10,000-Lumen Incandescent	430	17	515	962
400-Watt Mercury Vapor	6	43	232	281
175-Watt Mercury Vapor	---	---	4	4
250-Watt Mercury Vapor	2	---	79	81
<u>Low Voltage Multiple Circuit</u>				
1,000-Lumen Incandescent	---	---	60	60
2,500-Lumen Incandescent	10	4	54	68
4,000-Lumen Incandescent	142	5	109	256
6,000-Lumen Incandescent	34	5	84	123
10,000-Lumen Incandescent	10	---	14	24
5,500-Lumen Fluorescent	---	---	38	38
23,000-Lumen Fluorescent	38	---	4	42
100-Watt Mercury Vapor	---	---	111	111
175-Watt Mercury Vapor	45	---	3,783	3,828
250-Watt Mercury Vapor	34	---	1,641	1,675
400-Watt Mercury Vapor	304	---	4,660	4,964
700-Watt Mercury Vapor	---	---	369	369
1,000-Watt Mercury Vapor	---	---	100	100
250-Watt Sodium Vapor	---	---	309	309
400-Watt Sodium Vapor	---	---	658	658
<u>OVERHEAD CONNECTION</u>				
<u>High Voltage Series Circuit</u>				
2,500-Lumen Incandescent	1	---	---	1
4,000-Lumen Incandescent	14	---	---	14
<u>Low Voltage Multiple Circuit</u>				
2,500-Lumen Incandescent	2	---	---	2
4,000-Lumen Incandescent	58	---	49	107
6,000-Lumen Incandescent	8	---	---	8
175-Watt Mercury Vapor	14,697	---	2	14,699
250-Watt Mercury Vapor	1,908	---	---	1,908
400-Watt Mercury Vapor	802	---	---	802
TOTAL, JUNE 30, 1977	<u>20,298</u> 54.2%	<u>691</u> 1.8%	<u>16,457</u> 44.0%	<u>37,446</u> 100%
TOTAL, JUNE 30, 1976	20,429	692	16,257	37,378
NET CHANGE DURING THE YEAR	131	1	200	68

TABLE 15
BUREAU OF LIGHT, HEAT AND POWER

EXPENDITURES FOR OPERATION AND MAINTENANCE OF STREET LIGHTING
FISCAL YEAR 1976 - 77

CONTRACTUAL SERVICE

P. G. & E. Company

Company-owned facilities (a)	883,566		
Jointly-owned facilities (a)	30,875		
City-owned facilities (b)	<u>105,038</u>	1,019,479	
Less deduction for energy component		312,925	706,554
Emergency service to City-owned facilities			5,946

Lease-Lite Corporation

Group lamp replacement - City-owned facilities			58,485
--	--	--	--------

Lease-Lite Corporation

Maintenance and repair - City-owned facilities			
Routine maintenance		50,130	
Repair of damage caused by accidents (c)		53,392	
Repair of damage caused by equipment failure		44,857	
Repair of damage caused by vandals		<u>2,615</u>	150,994

MATERIAL AND SUPPLIES (FURNISHED BY CITY)

Damage caused by accidents (c)	37,713		
Damage caused by equipment failure	14,495		
Damage caused by vandals	<u>2,160</u>		54,368

ELECTRIC ENERGY (HETCH HETCHY)

45,976,235/KWH at \$0.02408/KWH less 48.6% discount			569,053
---	--	--	---------

TOTAL EXPENDITURE			1,545,400
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LESS AMOUNT PAID TO HETCH HETCHY FROM:

Gas Tax Funds for State Highway Routes	18,773		
Recreation and Park Department for off-street lighting	2,341		21,114

TOTAL NET EXPENDITURE			<u>1,524,286</u>
-----------------------	--	--	------------------

AVERAGE OPERATING COST

Based on number of lights in service June 30, 1977, average total cost of operation, maintenance and repair per light per year:			<u>40.71</u>
---	--	--	--------------

- NOTES: (a) Includes maintenance, repair, fixed charges and electric energy for Company-owned facilities.
- (b) Includes replacement of individual lamp and broken glassware, service and switching charges, and electric energy.
- (c) When responsible party is known, claim is filed for recovery of cost.

TABLE 16
BUREAU OF LIGHT, HEAT AND POWER

NEW CITY-OWNED STREET LIGHTING INSTALLATIONS
COMPLETED DURING FISCAL YEAR 1976-77

<u>Locations</u>	<u>Number of Lights</u>	<u>Type of Lights*</u>	<u>Value</u>
Financed by Bond Issues:			
Trumbull St. - Mission to Alemany St.	11	MV	\$ 22,001
Fillmore - Chestnut	58	MV	77,968
Bayshore Blvd. - Costa St. to County Line	27	MV	
	140	SV	286,520
Fillmore - Sutter	54	MV	65,401
Maiden Lane - Grant Ave. to Kearny St.	4	MV	6,132
Outer Richmond and Sunset Area	125	MV	284,133
Potrero Ave. - Division to Army	119	MV	118,881
Valencia St. - Market to Mission	142	MV	293,066
Eugenia Ave. Stairway, Prospect Ave. to Winfield St.	<u>2</u>	MV	<u>6,944</u>
Total	682		\$1,161,045
Financed by State Gasoline Tax:			
John Muir Drive	5	MV	\$ 17,310
Newhall and Mendall Sts.	<u>4</u>	MV	<u>6,523</u>
Total	9		\$ 23,833
Grand Total	691		\$1,184,878

*MV - Mercury Vapor

SV - Sodium Vapor (High Pressure)

TABLE 17

BUREAU OF LIGHT, HEAT AND POWER

HISTORICAL COST OF CITY-OWNED STREET LIGHTING IMPROVEMENTS

Fiscal Year	Ad Valorem Taxes	Gasoline Taxes	Street Lighting Bonds	Property Owners	State Highway Dept.	Miscellaneous Sources*
Prior to						
July 1, 1953	\$1,748,675	\$ 617,115	-	\$576,404	\$ 22,650	\$477,651
1953-54	142,151	22,181	-	23,495	2,274	1,239
1954-55	155,727	30,817	-	748	16,578	543
1955-56	15,704	48,620	-	2,484	19,181	1,360
1956-57	114,168	26,641	-	7,256	-	3,003
1957-58	2,501	64,942	-	18,199	4,142	-
1958-59	-	171,367	-	10,231	626	89,784
1959-60	-	100,126	-	35,874	10,242	182,762
1960-61	-	82,074	-	19,236	-	150,325
1961-62	-	200,113	-	116,376	24,550	103,175
1962-62	-	84,328	-	21,700	-	349,032
1963-64	-	340,108	-	32,556	6,000	106,028
1964-65	-	97,846	-	8,975	50,857	378,664
1965-66	-	474,673	\$ 522,899	-	-	157,678
1966-67	-	111,164	188,312	5,000	-	997,572
1967-68	-	175,949	331,941	-	-	304,476
1968-69	-	374,229	616,722	-	40,250	507,890
1969-70	-	359,635	261,000	-	-	1,031,201
1970-71	-	490,031	1,550,442	-	-	620,635
1971-72	-	541,534	1,810,011	-	-	2,040,473
1972-73	-	451,614	-	-	-	2,351,545
1973-74	-	266,764	236,314	-	-	451,614
1974-75	-	297,318	123,115	-	-	503,078
1975-76	-	347,870	376,928	-	-	420,433
1976-77	-	23,833	1,161,045	-	-	724,798
Totals	\$2,178,926	\$5,764,892	\$7,178,729	\$878,534	\$197,350	\$498,275
Less: Cost of portions removed prior to fiscal year 1975-76						\$1,919,424
Cost of portions removed during fiscal year 1976-77						122,275
Original cost of City-owned facilities in service on June 30, 1977						\$16,696,706
						\$ 2,041,699
						\$14,655,007

* Includes WPA and PWA (1935-1942). Boulevard Construction (1932-1934)
Municipal Railway, Recreation and Park Department and Housing

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7-78

CITY AND COUNTY OF SAN FRANCISCO

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A N N U A L R E P O R T

FISCAL YEAR 1977-78

HETCH HETCHY WATER AND POWER SYSTEM

AND

BUREAU OF LIGHT, HEAT AND POWER

P R E L I M I N A R Y

O. L. MOORE

GENERAL MANAGER

CITY AND COUNTY OF SAN FRANCISCO

GEORGE R. MOSCONE - MAYOR

PUBLIC UTILITIES COMMISSION

JOHN F. HENNING, JR.	President
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PETER McCREA	Commissioner
JOHN M. SANGER	Commissioner
JOHN B. WENTZ	General Manager

ANNUAL REPORT
FISCAL YEAR 1977-78

HETCH HETCHY WATER AND POWER DEPARTMENT

ORAL L. MOORE - General Manager

This report is respectfully dedicated to
Hetch Hetchy employees, past and present,
whose devoted and conscientious efforts
have made possible these accomplishments
for San Francisco.

HIGHLIGHTS

In spite of a very poor first half, resulting from drought, and in spite of rate limitations established by court order, Hetch Hetchy finished the year with record high power revenues, both as to gross and net after power purchases.

Starting with less than half full reservoirs at the beginning of the year, a third dry year was very much a possibility. In order to create the necessary funding to carry on operations in the face of potentially record expenditures for purchased power, a substantial portion of the previously budgeted capital improvements was rescinded. With heavy rains and snows falling on our mountain watersheds throughout the winter, resulting in spring runoffs which turned out to be the second highest recorded in the last 60 years, the severe drought, which has impacted the Department's operations during the past two years, ended and was replaced with a situation where our powerhouses were scheduled for all-out generation during the last half of the Fiscal Year. Combined with decreased power demands of the Modesto and Turlock Irrigation Districts, the increased generation permitted Hetch Hetchy to sell much of its power at market rates in the last 6 months. This enabled the Public Utilities Commission to transfer \$6 million of the Department's year-end surplus to the General Fund.

As noted later in the report, the remaining \$3 million from this year's surplus is earmarked for a reserve fund for protection of the City against possible failure of current litigation involving Hetch Hetchy power rates.

To illustrate the remarkable turn-around of the last 6 months, a few selected comparisons between the two halves of the year is revealing.

	<u>First 6 Months</u>	<u>Last 6 Months</u>
1. Dion R. Holm Powerhouse Generation	54 million kilowatthours	551 million kilowatthours
2. Total Hetch Hetchy Generation	280 million kilowatthours	1,121 million kilowatthours
3. Expenditure for Purchased Power	\$25.9 million	\$3.7 million
4. Net Power Revenue (Gross Revenue less Purchased Power)	\$5.2 million	\$15.8 million
5. Sales to Assigned Industrial Customers	0 kilowatthours \$0.2 million	207 million kilowatthours \$7.9 million

HETCH HETCHY ORGANIZATION AND FUNCTIONS

Under policies established by the San Francisco Public Utilities Commission, the HETCH HETCHY WATER AND POWER DEPARTMENT and the BUREAU OF LIGHT, HEAT AND POWER serve the City and County of San Francisco in the dual function of operating department and service bureau.

Hetch Hetchy is a municipally-owned system of storage reservoirs and aqueducts which collects water from the Tuolumne River watershed and delivers it to the San Francisco Water Department. As a by-product of falling water, Hetch Hetchy operates and maintains hydroelectric generating stations and high voltage transmission lines for the production and distribution of electric energy.

Through its Transit Power Division, Hetch Hetchy has funded, operated, maintained and provided improvements for the electric facilities of the San Francisco Municipal Railway since July 1, 1969.

In order to handle this additional responsibility, Hetch Hetchy assumed control of the equipment and personnel of the Overhead Lines and Motive Power Sections of the Municipal Railway.

All of Hetch Hetchy's expenses, including those of the Transit Power Division, are supported by water and power revenues.

The Bureau of Light, Heat and Power administers contracts for furnishing electric, gas and steam services to municipal departments and handles monthly billings. It also administers contracts for furnishing street lighting services and for operation and maintenance of City-owned street lighting. Financing, design and construction of City-owned street lighting improvements are under the jurisdiction of the Department of Public Works, and plans for these improvements must be approved by the Public Utilities Commission through this Bureau. The Bureau is financed by appropriations from municipal departments and gas tax funds.

For fiscal year 1977-78, the Department administered budgeted funds for all purposes as follows:

<u>Budget</u>	<u>Number of Employees</u>	<u>Total Amount Appropriated</u>
Hetch Hetchy Water and Power	224	\$ 47,896,609
Hetch Hetchy Water and Power (Transit Power Division)	59	1,647,178
Bureau of Light, Heat and Power	<u>11</u>	<u>15,909,708</u>
	294	\$ 65,453,495

HETCH HETCHY WATER AND POWER SYSTEM

REVENUE AND EXPENDITURES

Revenue from Hetch Hetchy Water and Power operations is derived principally from two sources:

1. Sale of water to the San Francisco Water Department
2. Sale of electric power and energy to San Francisco Municipal departments, Modesto and Turlock Irrigation Districts in the San Joaquin Valley, and seven industrial customers:

Kaiser Cement & Gypsum Corporation	Santa Clara County
Kaiser Aluminum & Chemical Corporation	Santa Clara County
Lockheed Missiles and Space Company, Inc.	Santa Clara County
General Motors Corporation	Alameda County
IBM Corporation	Santa Clara County
Liquid Air, Inc.	Alameda County
Norris Industries, Riverbank	Stanislaus County

WATER SALES

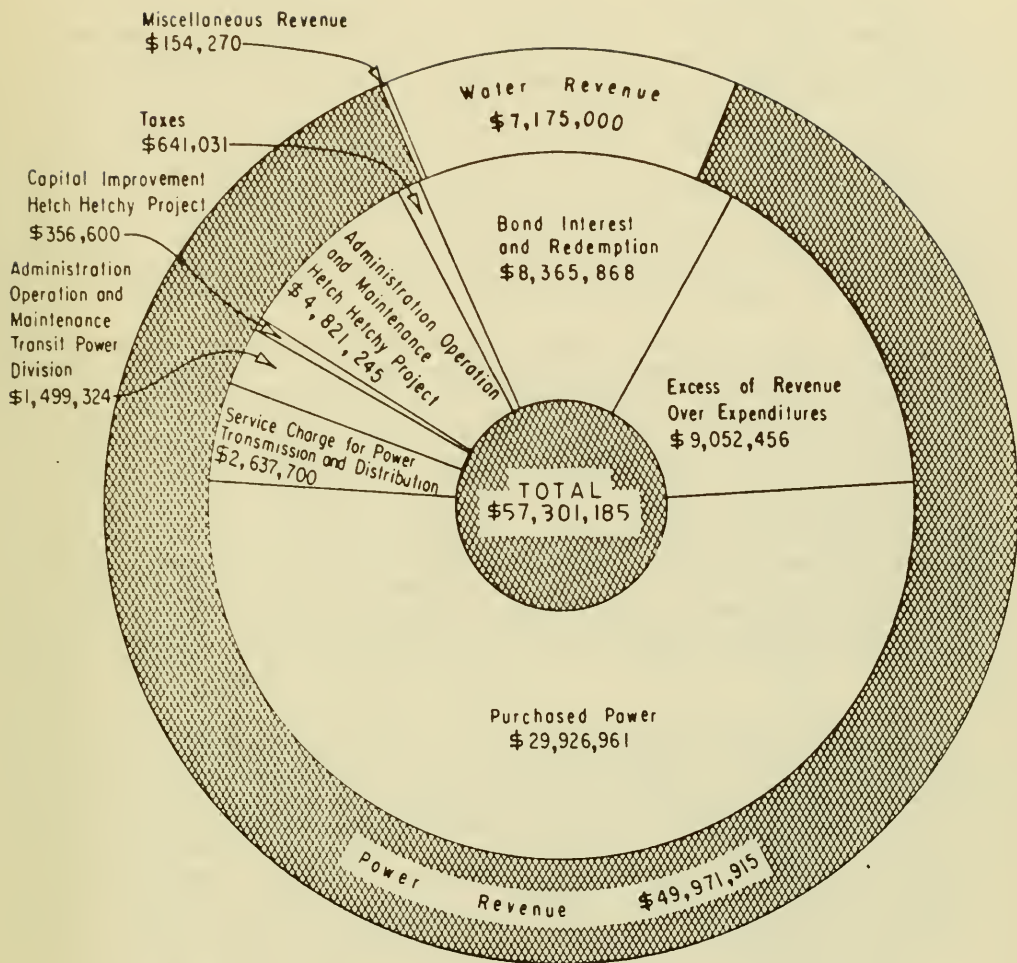
This past year revenue from the sale of water and standby service to the San Francisco Water Department was \$7.175 million

POWER SALES

Gross sales of electric energy was 49,971,915 , and increase of 6,629,942 from the \$43,341,973 for 1976-77. The increase, by itself, appears substantial, but the significance of the increase goes beyond these numbers for the following reasons:

- (1) The offset to this year's power revenue in terms of expenditure for supplementary power and energy is \$29,561,113, down from \$33,921,500, leaving a net revenue from gross of \$21,123,114 for the year as compared to \$9,420,473 for 1976-77. This new high in net revenue replaced the record \$18 million achieved in 1974-75.
- (2) The increase was achieved through the sale of power and energy generated during the months of March through June 1978 when all project plants were in maximum production in order to take full advantage of the record inflow and, at the same time, to delay filling of the reservoirs, thus minimizing spill.

Power and Energy delivered to the City Departments decreased 2.1 percent over the previous year. The City department mainly responsible for this decrease is the San Francisco Water Department whose consumption dropped 31.3 per cent. Due to the effectiveness of both voluntary and mandatory water rationing programs during the drought, there was considerably less need for pumping and filtration

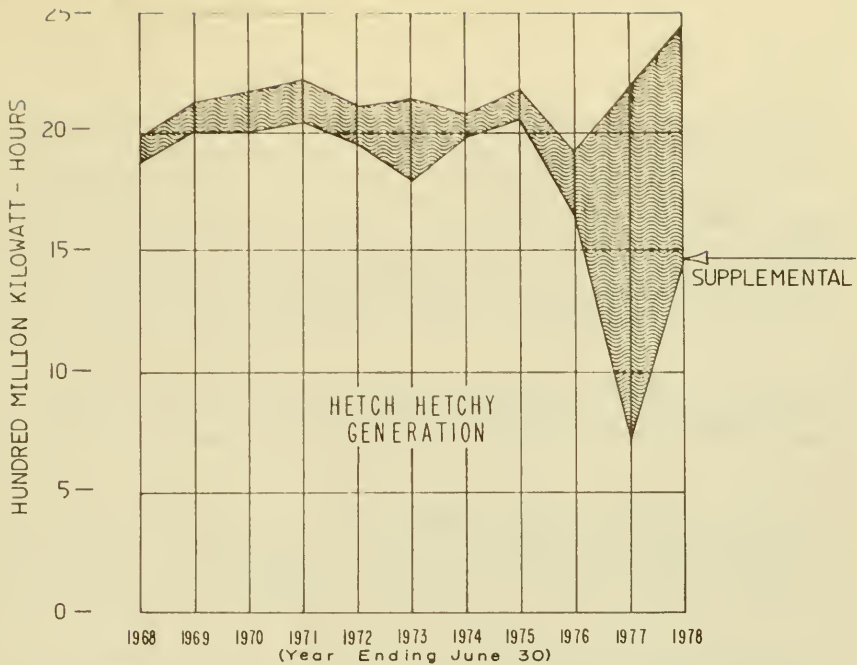


HETCH HETCHY REVENUES
AND EXPENDITURES
FISCAL YEAR 1977-78

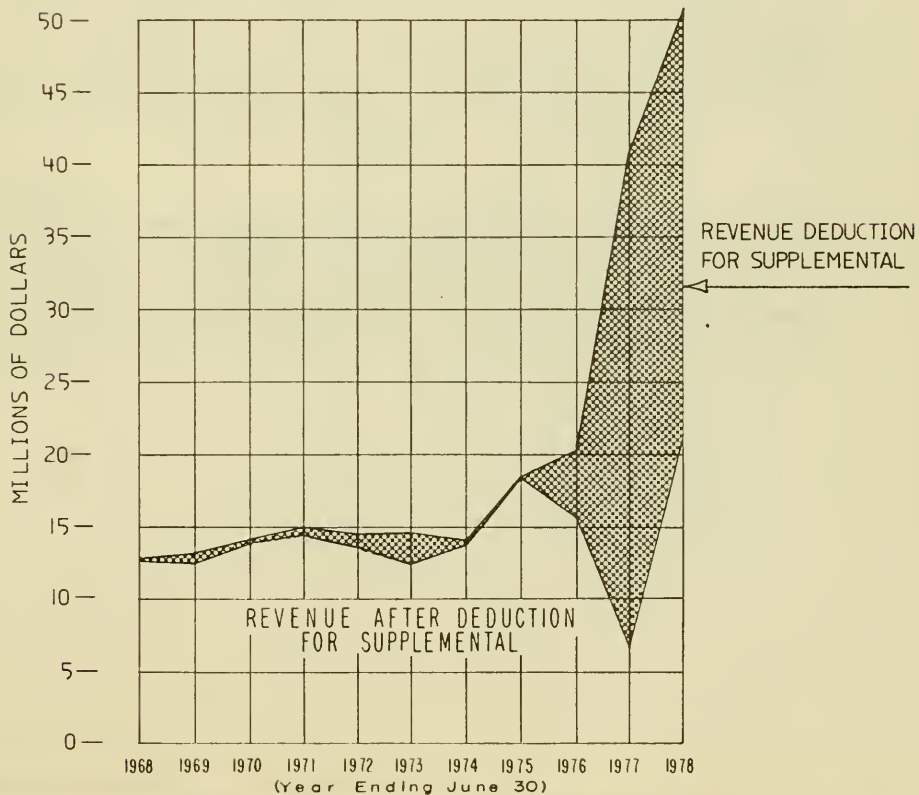
of the domestic water supply. On the other side of the ledger, consumptions of the Municipal Railway and the Unified School District for the year have increased 7.5 per cent and 5.5 per cent respectively. The increase incurred by the Municipal Railway is directly related to the completion of the John M. Woods Motor Coach Center and the Muni Metro Center, major facilities for the storage and maintenance of motor coaches, streetcars and eventually the new light rail vehicles. The magnitude of the increase incurred by the schools (including the community colleges) is uncharacteristic of the load based on historical records. A concerted effort in energy conservation might provide the key to reducing this growing consumption. Besides the San Francisco Water Department, consumption at the San Francisco International Airport also decreased -1.8 per cent as compared to previous year. In the face of continuing construction activities, this decrease seems to imply that energy conservation practices by both management and tenants might be bearing fruit.

Power and energy delivered to Modesto Irrigation District, perennially Hetch Hetchy's largest power customer, and to Turlock Irrigation District, normally the third largest but for 1977-78 the second largest, dropped 1.2 per cent and 2.6 per cent respectively this year. These decreases are directly related to the dramatic ending of the drought which enabled the two Districts to supply during the last 6 months over 244 million kilowatthours of energy from their own generation as compared to 31 million kilowatthours in the first 6 months. Total generation of 1,401,610,000 kilowatthours for the report year from the project's three power plants represents a doubling of the 710,002,000 kilowatthours for 1976-77 which had the unenviable distinction of being the lowest production year since completion of the expanded system in 1969. The financial impact of the additional generation can best be demonstrated by a comparison of the sales to the assigned industrial customers which are billed at current PGandE rates: zero kilowatthours for 1976-77 versus 210 million kilowatthours for 1977-78, producing a revenue gain of \$7.7 millions.

Two conflicting rulings rendered by U.S. District Court judges during the year have affected our revenue from sale of Hetch Hetchy power. Both cases center on the question whether prior approval of the Secretary of Interior is required for rates charged by the San Francisco Public Utilities Commission for sale of Hetch Hetchy generated power for commercial purposes. On September 15, 1977 Judge Cecil Poole, U.S. District Court for the Northern District of California, rendered a summary judgment in favor of City in the case of City and County of San Francisco vs. Various Airlines. Judge Poole ruled that the San Francisco Public Utilities Commission has the legal right to set rates for Hetch Hetchy power without approval of the Secretary of the Interior. The matter came to issue when the Public Utilities Commission, following historical practice, raised power rates to those prevailing in the service area in July 1975. The airlines initially refused to pay, contending that Hetch Hetchy power rates must be approved by the Secretary. On February 8, 1978. Judge Phillip Wilkins, U.S. District Court for the Eastern District of California, rendered two decisions in the case of the Modesto and Turlock Irrigation Districts vs. City and County of San Francisco. The case was initiated by the two Districts in response to City's withdrawing of Class 3 Power (commercial power) from them on July 1, 1976.



HETCH HETCHY ELECTRIC ENERGY SOURCES



REVENUE FROM SALE OF ELECTRIC ENERGY

In favor of the City, the Judge held that the right of City to withdraw Class 3 Hetch Hetchy power and substituting it with power purchased from PGandE involves a threshold question of contract interpretation which, by virtue of the arbitration clause in the contracts, must be referred to arbitration. Against the City is the decision that the Secretary of the Interior must approve Hetch Hetchy power rates and the City therefore is restrained from selling Hetch Hetchy power for commercial purposes to any purchaser at rates not approved by the Secretary. Notices of appeal have been filed by opponents of the decisions. Even with the two cases now consolidated on appeal, resolution of the issues appears a long way down the road.

Meanwhile, a reserve fund of \$6.125 million is being established from this year's remaining surplus and the anticipated surplus for 1978-79 to protect the City from a substantial liability should the pending litigation be resolved against the City.

Hetch Hetchy power is sold at cost to City Departments for municipal purposes, representing a saving to taxpayers for 1977-78 of approximately \$8 million, compared to the cost if supplied by the local investor-owned utility at rates which include a "fuel cost adjustment" to account for the high costs of non-renewable fuels used for electric generation.

In a continuing effort to maximize return of the power produced from its own system, Hetch Hetchy increased its rates for private consumers and municipal users to the level of current market value on July 1977 and again on April 1978. These increases would have more than doubled power revenue from the San Francisco International Airport - from about \$3 million a year to \$6.9 million. However, due to Judge Wilkin's decision as noted above, such hopeful gain was not achieved. Under guidelines suggested by the City Attorney's office while the injunction is being appealed, billing to the Airport tenants must revert to the Pre-July 1, 1975 rates beginning with the month of March 1978.

SYSTEM PLANNING

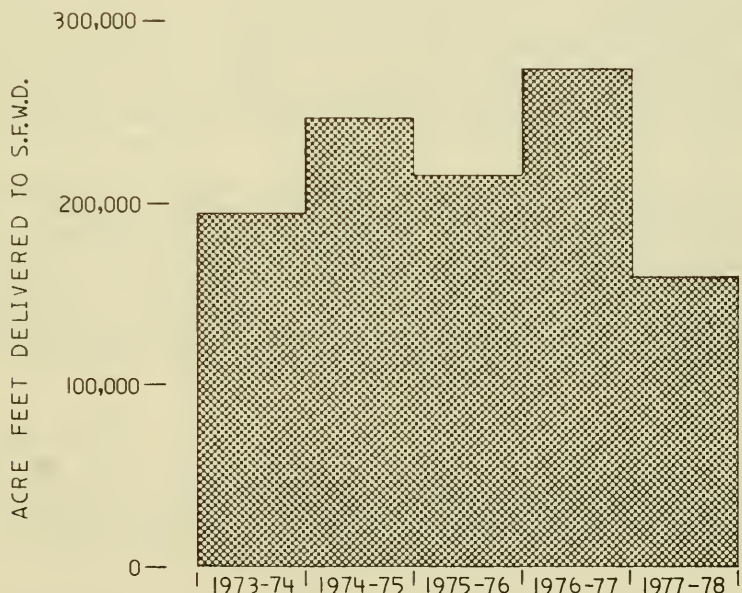
As mentioned in the annual report last year about plans for initiating a weather modification program in the Cherry watershed area to increase its water yield, the City on December 1977 entered into a professional services contract with Environmental Science Associates, Inc., Foster City, California, for the preparation of an Environmental Impact Report. Steady progress is being made on the report draft, with approximately 30 per cent completed as of the end of the fiscal year.

WATER PRODUCTION AND TRANSMISSION

Precipitation recorded for the year at our measuring stations was 159% of the long term average.

During the year, 51,935,400,000 gallons of water were diverted from the Tuolumne River watershed through the Hetch Hetchy Aqueduct to the San Francisco Water Department, representing 78% of the City's total customer consumption. In addition, 199,733,204 gallons, down 9% from last year, were delivered to the United States Atomic Energy Commission at Mocho Shaft of the City's Coast Range Tunnel for use at the Lawrence Radiation Laboratory at Livermore; 49,932,740 gallons, down 15% from 1976/77, were delivered to Groveland Community Service District in Tuolumne County from the Mountain Tunnel.

Appendix Table 6 shows comparative data on precipitation, runoff, storage and delivery of the Hetch Hetchy Water Supply System.



DELIVERIES OF WATER TO
SAN FRANCISCO WATER DEPARTMENT

OPERATION AND MAINTENANCE - TRANSIT POWER DIVISION

The Transit Power Division is responsible for supplying the 600 volt direct current power that is necessary to operate the streetcars and trolley coaches of the San Francisco Municipal Railway.

The Transit Power Division is composed of two sections - the Motive Power Section and the Overhead Lines Section.

Motive Power Section

The Motive Power Section presently operates and maintains sixteen substations which convert electric power from 12,000 volts alternating current to 600 volts direct current by means of motor-generators, synchronous converters, mercury arc rectifiers and silicon rectifiers. (See Appendix Table 3 for statistical data.) Motive Power is also responsible for maintaining the electric motors and associated control equipment for operating the cable-winding machinery located in the Cable Car Powerhouse at Washington and Mason Streets. In addition, Motive Power periodically inspects, cleans, adjusts and repairs the streetcar and trolley coach headway recorders at Central Control of the Municipal Railway. The substations operate 24 hours per day, 365 days per year.

In anticipation of the need to assume responsibility for the eighteen new substations being built by the Power Improvement Program (reported elsewhere in this report), this section perused and commented on the wiring and control schemes proposed for these stations. The first of the new electrical substations, Civic Center Station, was placed in revenue service in December of 1976. Subsequently, in fiscal year 1977-78, nine new substations were placed in service: Downtown, Church, Judah, Fillmore, Carl, San Jose, Randolph, Taraval and Laguna Honda.

A mimic board showing the new stations in schematic form was modified to incorporate these new stations at the Bryant Substation. As each new automatic station was completed and became operational, it was monitored and controlled from this remote location via telephone lines, since all the new stations are presently unmanned. The controls for these stations were designed and installed on this mimic board. This status display and control board will continually be augmented with additional automatic station controls until such time as it shall be superseded by a more sophisticated and flexible Supervisory Control System.

Overhead Lines Section

The primary function of the Overhead Lines Section is to maintain in satisfactory operating condition the trolley wire overhead facilities and the electric distribution system which conveys power to it. This electric distribution system consists of both overhead lines and underground cables.

Secondary functions include the maintenance of the Municipal Railway Signal Systems and the electric light and power installations at all Municipal Railway buildings.

During fiscal year 1977-78, the Overhead Lines Section responded to 3,649 emergency calls, a decrease of 8% over the prior year. In addition to emergency calls, this section performed a regular and extensive ongoing maintenance program. All overhead and underground facilities were systematically inspected and all worn or damaged parts that could cause accidents or equipment malfunctions were replaced. This section also operated an emergency crew 24 hours a day year round, including all holidays. The main work crew normally worked on the day shift but occasionally was assigned to night work to overhaul facilities during the hours Muni trolleys and streetcars do not run.

A considerable amount of damage to overhead facilities was caused by trolley coaches de-wiring and snagging their poles in the overhead facilities and tearing them down, or by breaking the spans with the flaying poles. Such damage was repaired at no cost to the Municipal Railway. Other parties who damaged our facilities were billed for the cost of repairs. This included damage to overhead facilities caused by high loads on trucks or careless operation of crane equipment and damage to underground feeder cables by contractors digging into our duct lines. During 1977-78, responsible parties were billed for 11 damage cases totaling \$6,946.34. The Overhead Lines Section also performed work for 19 building owners and contractors under work orders amounting to \$23,587.32. This work included moving trolley poles to accommodate driveways; relocating trolley poles and feeders to permit construction of new buildings; temporarily removing trolley wires and feeders to permit passage of high loads; and shifting of trolley wires and feeders for various excavations.

The Overhead Lines Section engaged in many other activities of a related nature which it is especially equipped to perform. These additional duties included repairs, maintenance and construction of electrical systems in Muni's car barns, offices and shops; welding and rebuilding of worn overhead lines special work; making and rebuilding parts for switches, warning block signals, car recorders, and strand alarms for the cable car system; installing mobile radio equipment; installing streetcar and bus stop signs and public information signs.

ENGINEERING DIVISION

The Engineering Division of Hetch Hetchy Water and Power provides engineering services for the Hetch Hetchy Project, Transit Power Division and the Power Improvement Program. These services include the preparation of studies, reports, cost estimates, and plans and specifications for new construction, for replacement of structures and for items of major maintenance. Surveying, inspection of construction, contract administration and payment recommendations are provided for all construction work under Hetch Hetchy Water and Power. Work of unusual magnitude or which requires special knowledge and expertise is done by engineering consulting firms which have the necessary manpower and qualifications. The Engineering Division is organized into six main sections: Civil and Construction, Electrical, Mechanical, Architectural, Engineering Administration, and Special Projects (Power Improvement Program).

During the year, plans and specifications were prepared for the following work to facilitate and maintain Hetch Hetchy operations:

HH-549 - Bryant Substation and Power Control Center (Under Power Improvement Program)

Plans and specifications for the Bryant Substation and Power Control Center, "Construct Building and Install Equipment", was completed in January 1978. Hetch Hetchy Water and Power and our consultants, Bechtel Incorporated have jointly prepared the plans and specifications. The Power Control Center portion of the building was exclusively designed by Hetch Hetchy. The building will be constructed on vacant City property, located adjacent to the existing Bryant Substation. The substation will supply 615 volt D.C. traction power to Municipal Railway trolley coaches. The Power Control Center will accommodate facilities for a shop, offices, and a power system supervisory control room.

The PUC received bids on March 2, 1978, and the responsible low bid of \$1,020,000 submitted by Moore Construction of San Francisco was approved and the contract was awarded by PUC on March 14, 1978. Construction commenced in June 1978 and completion of project is scheduled for July 1979. The Bryant Substation and Power Control Center will complete the new substation construction program under the Power Improvement Program (PIP).

HH-566 - San Joaquin Valve House - Backflow Prevention and Replacement of Miscellaneous Mechanical Work

Contract documents were prepared to prevent contaminated and polluted river water in Elliott Cut from entering the pipelines when they are drained for maintenance purposes in this area. The contract also includes the replacement of certain mechanical appurtenances at the valve house, Oakdale meter house and on the pipelines.

HH-570 - Surface West Portal and Priest Roads

A construction contract was let to resurface and seal the service roads into West Portal and Priest Reservoir to prevent the further deterioration of these roadways.

HH-577 - Oakdale Portal Sand Trap

Plans and specifications have been prepared to construct a sand and gravel trap in the existing manifold which connects the San Joaquin pipelines to the Foothill Tunnel. The pipelines are being subjected to unusual wear along the invert of the pipes, caused by sand and gravel carried from the tunnel into these pipes. This contract will eliminate this source of wear to the pipelines.

HH-591 - Cherry Road Slide Repair

Plans and specifications were prepared for repairing a slide area on Cherry Road near Cherry aqueduct tunnel portal 2-A by stabilizing the downhill slope and by excavating into the upslope bank to relocate a portion of the roadway away from the slide area.

HH-593 - Paint and Repair Downtown Substation (Under Power Improvement Program)

Plans and specifications have been prepared for the painting and repairs to the existing substation building. Work includes carbon-dust debris removal from building surfaces that was produced by the old rotary generators.

Existing large windows on Stevenson Street will be elevated for added security.

Interior and exterior painting and installation of additional lighting fixtures will complete the work on this operational substation.

HH-595 - Moccasin Sewage Plant, Replace Sanitary Sewer

Plans and specifications were prepared and a contract let for replacing a portion of the sanitary sewer in Moccasin Village which has deteriorated badly over the years. Construction is scheduled to start in July 1978.

Moccasin Powerhouse, Turbine and Bypass Bulkhead Gates. A purchase contract was let for the fabrication of structural steel gates which are required so that inspection or maintenance work can be performed in the discharge side of either unit separately, while the other unit remains in service. At present, both units must be shut down to accomplish this work. Bids were received in November 1977 with the gates to be delivered in July 1978.

During the months of February and March, the Foothill Tunnel and San Joaquin Pipelines were shut down for inspection. The following observations were reported:

Moccasin Re-regulating Reservoir

The bypass pipe is in good condition. The entrance to the Foothill Tunnel and Moccasin gate tower slide gate are in good condition, showing very little leakage with the reservoir elevation at 916.0(+).

Red Mountain Bar Wasteway

The slide gate is in good condition. The concrete mortar lining D/S of the gate had eroded in a number of places but were repaired during the shutdown.

Foothill Tunnel - Red Mountain Bar Wasteway to Oakdale Portal

The Tunnel from Rock River Lime Treatment Plant to Red Mountain Bar is in good condition; no slides nor blockages, but some water infiltration. The Tunnel from Rock River Lime Treatment Plant to Oakdale Portal is in excellent condition, with no new slides or blockages. Some infiltration water into the Tunnel was noted and measured to be approximately 38 cfm. The sand trap at Oakdale Portal surge shaft had collected no appreciable amount of snad and the bulkhead was removed.

San Joaquin Pipelines

Pipeline No. 1 - The mortar lining was in good condition, showing no erosion nor deterioration on the invert section with less than 1/16 in. depth of the lining showing signs of "dead" mortar.

Pipeline No. 2 - The lining in this pipeline shows considerable deterioration since the last inspection three years ago. Some of this changed condition is due to the cleaning attempts performed under HH Contract 511-R. Areas of "dead" mortar have been removed along with small pieces of lining adjacent to cracks and previous bare metal spots. The coal tar paint east of Oakdale is doing an adequate job of protecting the mortar lining.

Pipeline No. 3 - The mortar lining on the invert of the line has eroded to a width of 14 in. to 18 in.; along this trough there remains a maximum of 1/4 in. mortar and in much of the area bare metal has been exposed. The remaining lining shows some deterioration due to leaching cement from the mortar by the pure water from Hetch Hetchy Reservoir. The outer 1/16 in. to 1/8 in. is "dead" mortar and can be removed by a single pass with a sharp metal object. Below this "dead" mortar, the remaining 3/8 in. to 1/2 in. of lining is hard, sound mortar.

Trolley Overhead Program (TOP)

The Public Utilities Commission has filled an application with the Department of Transportation, United States of America, for a grant under the Urban Mass Transportation Act of 1964, as amended, for a trolley coach overhead program for the San Francisco Municipal Railway. The program will be administered by Hetch Hetchy Water and Power since it is responsible for power distribution to Municipal Railway trolley coaches. The Trolley Overhead Program (TOP) will reconstruct and replace worn-out portions of the existing trolley coach system and construct trolley coach interconnections, turnarounds and traffic adjustments.

The estimated cost of the program is \$12,692,000 of which \$10,153,600 (80%) will be funded by the Federal Government and \$2,538,400 (20%) will be funded from Hetch Hetchy revenues.

Installation of Depth Sensor in Rock River Shaft of Hetch Hetchy Aqueduct

A transducer type depth sensor was installed in the Rock River Shaft of the Hetch Hetchy Aqueduct with a signal cable connecting the sensor to a digital readout indicator in the operator's office of the adjacent Lime Treatment Plant. This installation permits the Moccasin operator to telephone the operator of the Lime Treatment Plant and obtain the reading of the water level indicator. By knowing the water level at the Moccasin Reservoir and the water level at the Rock River Shaft, the flow in the aqueduct can be readily determined. Prior to the installation of the depth sensor, it was necessary to dispatch a man to the Oakdale Portal of the aqueduct to read the pressure gauge.

Sale of Diseased Trees - Baseline Road - East of Camp Mather

An Agreement to sell diseased Ponderosa and Sugar Pine Trees located on Baseline Road East of Camp Mather on property owned by the City and County under the jurisdiction of Hetch Hetchy Water and Power was processed through the City Purchasing Department.

Under the Agreement, twenty-seven (27) trees were sold to Mr. Mark J. Wienert, Jr., of Wienert Lumber Company. A payment of approximately \$4,500, based on terms of the Agreement was transmitted by Mr. Wienert to the Purchasing Department for deposit in a Hetch Hetchy Water and Power account.

ENGINEERING DIVISION - Power Improvement Program

Work during Fiscal Year 1977-78 under the UMTA-approved Federal Grant for the Power Improvement Program was as follows:

1. Project Status

As of the end of the fiscal year, approximately \$32 million of the \$50.5 million Project grant has been expended or encumbered. The professional services contracts for engineering design are 95% completed. Forty-seven contracts for construction work and material purchases have been completed and seventeen are currently in progress. Ten of the eighteen substations have been completed and are in service, and two additional are under construction. The old Turk-Fillmore and West Portal Substations have been taken out of service. Electrification of the Market Street Subway and Twin Peaks Tunnel is completed and has been tested by operation of the new Light Rail Vehicles. Conversion of the surface streetcar overhead trolley system for pantograph operation is nearly completed on the "K" line, the "N" and "J" lines are under construction, and the "L" and "M" lines are in the final design stages. Thirty-six miles of the eventual forty-five miles of underground duct lines are completed or under construction. Approximately 55% of the 1.5 million feet of underground feeder cable has been installed and some of the abandoned overhead feeders have been removed. Details of the various projects and contracts are in the following sections.

2. Electrification and Overhead Conversion

A) Contracts

Construction was completed on Contracts HH-521, Market Street Subway Electrification, Embarcadero Station to Duboce Portal and HH-531, Market Street Subway Electrification, Duboce Junction to Eureka Station. On November 7, 1977, the new electrification system was energized for the first time. Fifteen circuit breakers were closed at the recently completed Downtown, Civic Center and Church Substations, sending 600-volt dc power through 35 miles of power cables feeding the new 3-1/2 mile, twin-tunnel, overhead-catenary system. All circuits tested satisfactorily. On November 8, 1977, the first electrically powered vehicle was operated in the new subway. P.C.C. Streetcar No. 1008, outfitted with a LRV-type pantograph, was run from the Eureka Station to the Embarcadero Station and back, first at slow speed and then at speeds up to 40 mph. Operation of the pantograph on the catenary tested satisfactorily. On December 16, 1977, the first LRV was operated in the subway. 50 mph speed runs were made by a single LRV and, on December 22, 1977, the first two-car train made its initial runs in the subway. Testing of the two LRVs in the subway and on the existing and partially reconstructed surface overhead trolley system continued. Additional test runs were made, with a single LRV and a two-car train, confirming the operation of the pantograph and the LRV on the new catenary system and power system. Final testing of the new catenary system in the Market Street Subway, following minor adjustments resulting from earlier testing, was satisfactorily completed on June 23, 1978.

Construction neared completion on Contract HH-524, K Line Streetcar Overhead System, Conversion for Pantograph Operation.

Construction neared completion on Contract HH-536, Streetcar Overhead System, West Portal Avenue, Conversion for Pantograph Operation.

PIP and TIP construction work was completed on DPW Contract 23,727 for Ocean and Phelan Avenues Rechannelization, which included relocation of trolley poles and the overhead trolley wire system, along with Muni streetcar track relocation and rerailing.

Plans and specifications for Contract HH-532, "N" Line Streetcar Overhead System, Church Street to Nineteenth Avenue, Conversion for Pantograph Operation, and Sunset Tunnel Electrification, were transmitted to UMTA for approval on August 5, 1977. The plans and specifications were approved by UMTA on August 19, 1977. Bids were received on September 15, 1977. The contract was awarded on September 27, 1977, to Amelco Electric, San Francisco, California, who submitted the low bid of \$441,552. The contract was certified by the City Controller on November 8, 1977. Construction commenced on November 28, 1977.

Plans and specifications for the PIP and TIP portions of the Department of Public Works (DPW) Contracts 23,919 and 23,920 - Judah Street, 19th to 32nd Avenues and 32nd Avenue to LaPlaya, Street Improvement and Track Reconstruction, which include replacement of trolley poles and conversion of the streetcar overhead system for pantograph operation, along with Muni streetcar track rerailing, were advertised by the Department of Public Works on July 29, 1977 and August 30, 1977 respectively. Bids were received on August 31, 1977 and on September 21, 1977. Contract 23,919 was awarded on September 30, 1977, to Bay Cities Paving and Grading, Inc., who submitted the low bid in the amount of \$1,333,215. Contract 23,920 was awarded on October 24, 1977 to Homer J. Olsen, Inc., who submitted the low bid in the amount of \$1,474,515. Construction commenced on both contract on December 7, 1977.

Plans and specifications for Contract HH-533, "J" Line Streetcar Overhead System, Duboce Avenue to 30th Street, Conversion for Pantograph Operation, were completed and transmitted to UMTA for approval on February 9, 1978. The plans and specifications were approved by UMTA on February 16, 1978. Bids were received on March 30, 1978. The contract was awarded on April 11, 1978, to L. K. Comstock & Co., who submitted the low bid in the amount of \$576,990. The contract was certified by the City Controller on May 8, 1978. Construction work commenced on May 22, 1978.

The manufacturer, Ohio Brass Co., completed fabrication of the special trolley coach/streetcar crossing hardware (Contract No. 2). The special hardware was delivered on January 6, 1978. The hardware will be installed under Contract HH-533.

B) Design

The consultant, PBQ&D, Inc. and Gibbs & Hill, Inc. (PBGH) completed design work on contract plans and specifications.

Final plans and specifications for Contract HH-534, "L" Line Streetcar Overhead System, West Portal Avenue to Wawona Street, Conversion for Pantograph Operation, were received from the consultant on October 14, 1977. Advertising of the contract was deferred until completion of rerailing work by Muni. Final contract documents are being prepared for advertising in October, 1978.

Final plans specifications for Contract HH-535, "M" Line Streetcar Overhead System, St. Francis Circle to Plymouth and Broad Streets, Conversion for Pantograph Operation, were received from the consultant, PBGH, on February 3, 1978. Advertising of the contract was deferred until completion of rerailing work by Muni. Final contract documents will be prepared for advertising in December, 1978.

Work commenced on preparing the plans and specifications for the final relocation and conversion to pantograph operation of the overhead trolley wire system within the limits of the new West Portal Station. The information will be transmitted to BART and the work will be performed under an allowance in BART Contract IS0041.

Work commenced on preparing plans and specifications for the purchase and installation of special overhead hardware to permit temporary PCC streetcar operation at the Muni Metro Rail Center. The new overhead system being installed under Contract MR-609 was designed for LRV pantograph use only.

3. Substations

A) Contracts

Construction was completed on Contract HH-522, Civic Center, Church, and Downtown Substations, Installation of Electrical Equipment. On October 19, 1977, Unit No. 2 (4,000 kw transformer and rectifier) was energized and placed in operation at Downtown Substation. This completed the final phase of the equipment conversion and put the substation in full service.

Construction was completed on Contract HH-528, Laguna Honda and Judah Substations, Construct Buildings and Install Equipment. On October 25, 1977, the new 3,000 kw transformer and rectifier at Laguna Honda Substation were energized. Final connections in the Twin Peaks Tunnel were made in November 1977 and the substation was placed in service on December 16, 1977.

Construction was completed on Contract HH-529, Carl Substation, Construct Building and Install Equipment. On February 10, 1978, the 12 kv electric service connections were completed and the two 3,000 kw transformer-rectifier

units were energized. On March 11, 1978, after connections were made to feeder cables outside the substation (under Contract HH-552), the substation was placed in service and began supplying power to the "N" Judah Streetcar line from Ninth Avenue to Church and Duboce (including the Sunset Tunnel).

Construction was completed on Contract HH-544, Fillmore Substation, Construct Building and Install Equipment, on January 31, 1978. On January 13, 1978, the 12 kV electric service connections were completed and the two 4,000 kw transformer-rectifier units were energized. On March 31, 1978, after connections were made to feeder cables outside the substation (under Contract HH-540), the substation was placed in service and began supplying power to various trolley coach lines.

Construction was essentially completed on Contract HH-546, Randolph Substation, Construct Building and Install Equipment. On March 16, 1978, the 12 kV electric service connections were completed and the 3,000 kw transformer-rectifier unit was energized. The substation will supply power to the "M" Streetcar line when service is resumed following the current rerailing project.

Construction was essentially completed on Contract HH-547, San Jose Substation, Install Equipment. On March 15, 1978, the substation was placed in service. The 4,000 kw transformer-rectifier unit began supplying power to the new Muni Metro Center and to the streetcar lines Ocean Avenue.

Construction was completed on Contract HH-548, Taraval Substation, Construct Building and Install Equipment. On May 16, 1978, the 4,000 kw transformer-rectifier unit was energized and placed in service supplying power to the "L" streetcar line on Taraval Street.

Plans and specifications for Contract HH-549, Bryant Substation and Power Control Center, Construct Building and Install Equipment, were completed and transmitted to UMTA for approval on January 26, 1978. The plans and specifications were approved by UMTA on February 8, 1978. Bids were received on March 2, 1978. The contract was awarded on March 14, 1978 to Moore Construction Co., San Francisco, California, who submitted the low bid of \$1,020,000. The contract was certified by the City Controller on April 5, 1978. Construction work commenced on April 24, 1978.

Plans and specifications for Contract HH-550, West Portal Substation, Install Equipment, were completed and transmitted to UMTA for approval on November 23, 1977. The plans and specifications were approved by UMTA on December 13, 1977. Bids were received on December 21, 1977. The low bid, in the amount of \$244,300, was submitted by L. K. Comstock & Co. However, the low bidder, and the second and third bidders, failed to meet the Minority Business Enterprise and Affirmative Action requirements. All bids were rejected by the Public Utilities Commission on January 10, 1978, and the contract was readvertised as Contract HH-550R, West Portal Substation, Install Equipment. Bids were received on February 2, 1978. The contract was awarded on February 14, 1978 to Emil J Weber Electric Co., San Francisco, California, who submitted the low bid of \$220,033. The contract was certified by the City

Controller on March 13, 1978. Construction work commenced on April 3, 1978. On May 31, 1978, the old West Portal Substation was shut down. The existing equipment was removed and placed in storage for later installation at Richmond Substation under Contract HH-551. The existing structure was demolished by BART to enable completion of the new West Portal Station.

Feeder cable connections were completed under Contracts HH-540 and HH-552 to transfer circuits and loads from the old Turk Substation to the new Fillmore, Carl, Civic Center and Church Substations. On April 20, 1978, the final circuit change was completed and Turk Substation was taken out of service. Following removal and salvage of equipment belonging to Pacific Gas and Electric Company and the City, the building will be disposed of by Muni.

B) Design

Work resumed on the completion of final plans and specifications for Contract HH-545, Outer Mission Substation, Install Equipment. The work had been deferred until the completion of the new San Jose Substation under Contract HH-547. Following the energizing of San Jose Substation, Outer Mission Substation was temporarily shut down and the old mercury-arc rectifier was removed and replaced by the new 750 kw silicon-diode unit. The work was done by the Transit Power Division personnel. The station trolley coach load was carried by the San Jose Substation. Contract HH-545 will complete the substation rehabilitation and furnish and install auxiliary equipment.

Work resumed on the completion of final plans and specifications for Contract HH-551, Richmond Substation, Install Equipment. The work had been deferred until the equipment from the old West Portal Substation became available as a result of work under Contract HH-550R. The equipment will be installed at Richmond Substation to replace obsolete rotating machinery.

Work commenced on the preparation of plans and specifications for Contract HH-597, Laguna Honda Substation, Install Additional Equipment. The additional equipment consists of the second rectifier unit to provide power reliability in the Twin Peaks Tunnel, as approved in the Project Amendment.

Work commenced on the preparation of plans and specifications for Contract HH-598, Civic Center and Church Substations, Escape Hatches and Related Work. This contract will construct emergency exits from the underground substations that were not provided in the original construction of the structures by BART.

C) Equipment Purchase

Modification No. 3 to the purchase contract with ITE-Could, the equipment supplier, to provide additional equipment for Laguna Honda Substation (a second rectifier, transformer and related switchgear) was submitted to UMTA for approval on July 6, 1977. The modification of contract, in the amount of \$357,367, was approved by UMTA on August 11, 1977. The modification of contract was executed on August 25, 1977.

Modification No. 4 to the purchase contract, to provide additional feeder circuit breakers for Downtown, Civic Center and Church Substations, in the amount of \$136,907, was submitted to UMTA for approval on June 23, 1978. The additional breakers are required to maintain trolley coach service on Market Street which had been scheduled to be rerouted to Mission Street in the original plan.

The substation equipment manufacturer, ITE-Gould, completed deliveries to the local warehouse of the additional equipment for Laguna Honda Substation (the second rectifier, transformer and related switchgear) ordered under contract Modification No. 3.

Substation equipment, furnished to the City under the purchase contract and stored by ITE-Gould at the local warehouse, was received at the warehouse by the City's installation contractors and transported to and installed in the various substations. All equipment, except for Bryant Substation and Laguna Honda Substation addition, has been delivered to the sites.

The Service Engineer, assigned by ITE-Gould to assist during installation and testing of the new equipment, continued to provide assistance, as required.

Work continued on the preparation of plans and specifications for the purchase of additional substation equipment for Stations E, F, J and N.

4. Control and Communication

The consultant, Systems Control, Inc., submitted final plans and specifications for Contract HH-569, Supervisory Control System - Equipment Purchase and Installation on December 9, 1977. Final contract documents are being prepared.

The consultant continued work on the plans and specifications for Contract HH-574, Communication Cable and Subway Maintenance Telephone System Installation.

5. Cable Purchase

243,000 feet of cable previously ordered under the contract with Cyprus Wire & Cable Co. was received and delivered to various installation contractors. These deliveries completed receipt of the 780,000 feet of cable ordered under the purchase contract.

Bids were received by the City Purchaser on July 8, 1977 for a second purchase contract to provide the estimated 650,000 feet of insulated power cable required to complete the planned work under the Power Improvement Program. Review of the seven bids submitted indicated that the bid submitted by Phelps Dodge Cable & Wire Co., the second low bidder, was the lowest responsive bid. Supporting data was sent to UMTA along with a request for approval to award the contract. Approval was received from UMTA and the contract was awarded by the City Purchaser

to Phelps Dodge Cable & Wire Co. on September 29, 1977. Approximately 31,000 feet of insulated power cable was delivered by Phelps Dodge Cable & Wire Co. to our contractor, Amelco Electric Co., for installation in the Sunset Tunnel under Contract HH-532. An additional 35,000 feet of cable was order for Contract HH-578.

6. Feeder Undergrounding

A) Judah Street - 20th to 48th Avenues - Underground Power Facilities (Contract HH-523)

All work on this contract was completed in accordance with contract plans and specifications on May 18, 1978.

B) J, N, No. 22 and 33 Lines, Underground Power Facilities (Contract HH-552)

All work on this contract was completed in accordance with contract plans and specifications on May 5, 1978.

C) Folsom and Howard Streets, Eleventh Street to Main Street - Underground Duct System (Contract HH-559)

All work on this contract was completed in accordance with contract plans and specifications on November 16, 1977.

D) Haight Street - Stanyan to Cough - Underground Duct System (Contract HH-560)

All work on this contract was completed in accordance with contract plans and specifications on September 16, 1977.

E) Fillmore, Jackson, Presidio and Other Streets - Underground Duct System (Contract HH-561)

All work on this contract was completed in accordance with contract plans and specifications on October 10, 1977.

F) Fulton and McAllister Streets - 8th Avenue to Divisadero Street - Underground Duct System (Contract HH-562)

All work on this contract was completed in accordance with contract plans and specifications in December 1977.

G) Ocean Avenue and Phelan Avenue Rechannelization and Track Reconstruction (DPW Contract 23,727)

All PIP work was completed on DPW Contract 23,727 for Ocean and Phelan Avenues Rechannelization, which included the undergrounding of feeder cables, along with Muni streetcar track relocation and rerailing.

H) Sutter, McAllister and Fillmore Streets - Underground Power Facilities and Related Work (Contract HH-540)

The Contractor essentially completed the contract work on installation of feeder cable in duct lines constructed under Contract HH-525 and HH-526.

I) Hayes Street - Van Ness to Stanyan - Underground Duct System (Contract HH-567)

Bids were received on July 21, 1977 for constructing manholes and underground duct banks in Hayes Street between Van Ness Avenue and Stanyan Street. The contract was awarded on August 9, 1977 to Underground Construction Co., Inc., San Leandro, California, who submitted the low bid of \$363,288. The contract was certified by the City Controller on August 25, 1977. Construction work commenced on September 12, 1977. All work on this contract was completed in accordance with contract plans and specifications on March 7, 1978.

J) Ocean, San Jose and Onondaga Avenues, Underground Power Facilities and Related Work (Contract HH-578)

Plans and specifications were completed for the installation of feeder cables in duct banks constructed under DPW Contract 23,727 and Contracts MR-620 and HH-537.

Also included in this contract is the removal of overhead feeders on Ocean Avenue from Junipero Serra Boulevard to Mission Street and on San Jose Avenue between Ocean Avenue and Geneva Substation. The plans and specifications were transmitted to UMTA for approval on December 12, 1977, and were approved by UMTA on December 19, 1977.

Bids were received on January 12, 1978. The contract was awarded on January 24, 1978 to L. K. Comstock & Company, Inc., San Francisco, California, who submitted the low bid of \$123,185. The contract was certified by the City Controller on March 7, 1978. Construction commenced on March 27, 1978.

K) Union, Parnassus and Clayton Streets - Underground Duct System (Contract HH-579)

Plans and specifications for constructing manholes and underground duct banks in Union, Parnassus and Clayton Streets were completed and transmitted to UMTA for approval on August 29, 1977. The plans and specifications were approved by UMTA on September 14, 1977. Bids were received on October 13, 1977. The contract was awarded on October 25, 1977 to Homer J. Olsen, Inc., Union City, California, who submitted the low bid of \$318,350. The contract was certified by the City Controller on November 8, 1977. Construction commenced on November 28, 1977. All work on this contract was completed in accordance with contract plans and specifications on June 9, 1978.

L) Mission, Bryant, Alameda, 16th, 14th and 8th Streets, and South Van Ness Avenue Underground Duct System (Contract HH-580)

Plans and specifications for constructing manholes and underground duct banks in Mission, Bryant, Alameda, 16th, 14th and 8th Streets, and South Van Ness Avenue were completed and transmitted to UMTA for approval on January 26, 1978. The plans and specifications were approved by UMTA on February 6, 1978. Bids were received on February 16, 1978. The contract was awarded on February 28, 1978 to

Underground Construction Co., Inc., San Leandro, California, who submitted the low bid of \$530,353. The contract was certified by the City Controller on March 13, 1978. Construction commenced on April 3, 1978.

N) California Street, Eighth Avenue and 32nd Avenue - Underground Duct System (Contract HH-581)

Plans and specifications for constructing manholes and underground duct banks in California Street between Parker and 32nd Avenues, in 8th Avenue between California and Fulton Streets, and in 32nd Avenue between California and Clement Streets were completed and transmitted to UMTA for approval on April 17, 1978. The plans and specifications were approved by UMTA on April 25, 1978. Advertising of contract is awaiting scheduling with other work.

N) Broad Street and San Jose Avenue, M-Line Track Extension, Power Facilities and Sewer Replacement and Enlargement (Contract MR-644)

Bids were received by TIP on March 7, 1978 for Contract MR-644, Broad Street and San Jose Avenue, M-Line Track Extension, which includes construction of manholes and underground duct banks in San Jose Avenue and Broad Street from Plymouth Avenue to Mt. Vernon Avenue, for the Power Improvement Program. The contract was awarded on March 28, 1978 to Homer J. Olsen, Inc., who submitted the low bid of \$667,339, which includes \$118,250 for PIP work. The contract was certified by the City Controller on May 8, 1978. Construction commenced on May 15, 1978.

O) San Jose Avenue - Mt. Vernon Avenue to Metro Center, M-Line Track Extension (Contract MR-657)

Work continued on the preparation of plans and specifications for the PIP portion of work to be included in Municipal Railway Contract MR-657 for San Jose Avenue, M-Line Track Extension. The work to be included consists of construction of manholes and underground duct banks in San Jose Avenue from Mt. Vernon Avenue to the Metro Center.

P) South Van Ness Avenue - 16th Street to Army Street and Army Street - South Van Ness Avenue to Mission Street - Underground Duct System (Contract HH-582)

Q) Mission Street - Army Street to Geneva Avenue - Underground Duct System (Contract HH-583)

R) Mission Street - 2nd Street to Embarcadero, 3rd and 4th Streets - Market to Townsend - Underground Duct System (Contract HH-584)

Work commenced on the preparation of plans and specifications for constructing manholes and underground duct banks. Feeder cables will be installed in these duct banks under later contracts.

S) Installation of Folsom Street Trolley System (Contract HH-448)

Work continued on the preparation of plans and specifications for the undergrounding of feeders (PIP portion of the work) to be included in Contract III-448).

T) Fillmore, Jackson, Presidio and Union Streets - Underground Power Facilities (Contract III-585)

Work commenced on the preparation of plans and specifications for the installation of feeder cables in duct banks constructed under Contracts HH-561 and III-579.

U) Bryant, Alameda and 16th Streets - Underground Power Facilities Contract III-586)

Work commenced on the preparation of plans and specifications for the installation of feeder cables in duct banks constructed under Contract III-563, and in duct banks being constructed under Contract III-580.

V) Western Addition Area - Overhead Feeder Removal (Contract HH-592)

Work commenced on the preparation of plans and specifications for the removal of overhead feeders which were replaced by underground feeder cables under Contracts III-491, III-540 and HH-552.

BUREAU OF LIGHT, HEAT AND POWER

STREETLIGHTING

General

The lighting of public streets within the City of San Francisco is provided by facilities which are, on a City-wide basis, 44.2% owned by the City; 54.0% owned by the Pacific Gas and Electric Company; and a small percentage, 1.8%, jointly owned. In the underground areas, where the economic advantage of City ownership is greatest, 82.7% of the lights are City-owned. Five years ago, the corresponding figure was 80.2%.

In fiscal year 1933-34, the cost for streetlighting was \$1.25 per capita; last year, with approximately thirty times as much light on the streets and public thoroughfares, the cost per capita was approximately \$2.49.

Maintenance and repair of City-owned installations were performed under two contracts. One provided for group replacement of lamps in accordance with schedules developed by the Bureau. A second contract covered work required for repair of damaged and defective equipment, painting and miscellaneous maintenance.

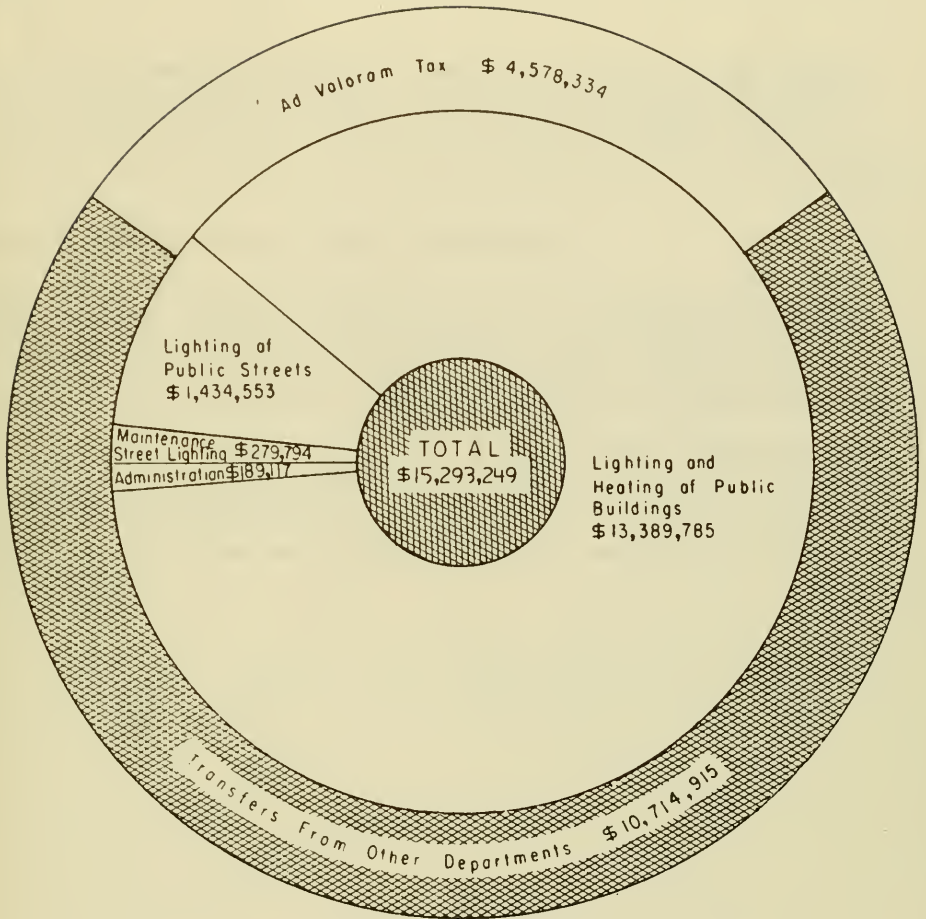
Under contract, the Pacific Gas and Electric Company furnished streetlighting service as directed, including the furnishing, maintenance and operation of Company-owned facilities. Certain services were provided also for City-owned facilities, including switching and control replacement of individual lamps and globes, and emergency work required during other than normal working hours.

Electric energy for all City and Company-owned streetlight operation was supplied by the Hetch Hetchy power system.

Engineering

The Bureau reviews, recommends changes, approvals or rejections of, and correlates all streetlighting installations, including that done by the Department of Public Works, the Pacific Gas and Electric Company, the State of California, subdividers, etc.

During the fiscal year 1977-78, 10 streetlighting contracts, involving a total of 495 new streetlights, were approved by the Public Utilities Commission. Plans were submitted for approval only after careful checking to determine that illumination will exceed the minimum requirements established by the American National Standards Institute; and that all materials used, and manner of installation, meet with the applicable local, state and federal rules, regulations and statutes governing the installation of electrical works.



BUREAU OF LIGHT, HEAT & POWER
REVENUES AND EXPENDITURES
FISCAL YEAR 1977-1978

UTILITY SERVICES TO MUNICIPAL DEPARTMENTS

General

Electric energy supplied to municipal departments is generated on the Hetch Hetchy power system and delivered to various service points by transmission and distribution facilities of Pacific Gas and Electric Company under a wheeling contract. Natural gas and steam supplied to municipal departments are furnished by the Pacific Gas and Electric Company under a service contract.

Municipal Consumption of Electricity, Gas and Steam

During the fiscal year, 489,325,403 kilowatthours of electrical energy were consumed through 1,072 municipal accounts at an expenditure of \$10,573,618. Of the above, 152,224,799 kilowatthours of energy were supplied to the San Francisco International Airport for resale to tenants. Natural gas consumption was 16,484,928 therms through 550 accounts at a cost of \$3,623,447.

There were several increases in gas rates last year which increased the cost to municipal accounts by approximately \$435,000. The average cost per therm increased by approximately 12%.

A summary of consumption and expenditures for these commodities is shown in Tables 12 and 13.

Operation and Maintenance

As of June 30, 1978, a total of 37,544 City-owned and Company-owned streetlights were in service to the public streets, parks, viaducts, overcrossings, tunnels and underpasses. A summary of the number and type of units in service at the end of fiscal year is shown in Appendix Table 14.

A total of \$1,740,591 was expended for operation, maintenance, and repair of the streetlighting system. Of the total cost, \$22,631 was paid by the State for its share of the operation and maintenance of streetlighting at intersections on City streets, which are part of the State Highway system.

During the fiscal year, there were 149 accidents involving damage to City-owned streetlighting property. Investigation was made, as soon as possible, to remove hazards to the public and obstructions to traffic. Total cost of repairs to damaged City-owned streetlighting property was \$139,679. Every effort was made to secure reimbursement for damages incurred from responsible parties. Previous experience indicates that more than half of the repair costs will be recovered.

Complaints

During the year, 39 complaints requiring field investigation were received and acted upon. These complaints concerned inadequate illumination, objectionable glare in windows, and requests for temporary and permanent relocation of streetlighting poles.

Improvements

During the fiscal year 1977,78, a total of 543 new City-owned streetlights were placed in service at a cost of \$913,585. Improvements were financed by State Gasoline Tax and the 1964 and 1972 Streetlighting Bond Issue as indicated in Appendix Tables 16 and 17.

TABLE 1

HETCH HETCHY WATER AND POWER

SUMMARY OF RECEIPTS, EXPENDITURES AND TAXES

FISCAL YEAR 1977-78

<u>RECEIPTS</u>	<u>Budget</u>	<u>Actual</u>	<u>-Under, Over</u>
Revenue from Sale of Electrical Energy	\$ 42,083,030	\$ 49,971,915	\$ 7,888,885
Revenue from Sale of Water and Standby Charge, SFWD	7,175,000	7,175,000	
Other Revenue	<u>100,000</u>	<u>154,270</u>	<u>54,270</u>
Total Revenue	<u>\$ 49,358,030</u>	<u>\$ 57,301,185</u>	<u>\$ 7,943,155</u>
<u>EXPENDITURES</u>			
Total Expenditures	<u>\$ 49,543,787</u>	<u>\$ 48,248,729</u>	<u>\$-1,295,058</u>
<u>TAXES</u>			
<u>Tax Levying Entity</u>	<u>No. of Bills</u>	<u>Assessed Values</u>	<u>Total Amount of Taxes</u>
Alameda County	10	\$ 2,650.00	\$ 310.74
San Joaquin County	12	49,375.00	4,880.22
San Mateo County	16	4,245.00	349.16
Stanislaus County	80	136,320.00	13,404.52
Tuolumne County	43	6,642,856.00	621,176.64
Ranta-Carbona Irrigation Dist.	1	4,391.16	188.82
Oakdale Irrigation Dist.	4	26,710.00	552.20
West Stanislaus Irrigation Dist.	<u>1</u>	<u>4,250.00</u>	<u>168.30</u>
Total	<u>167</u>	<u>\$ 6,870,797.16</u>	<u>\$ 641,030.60</u>

TABLE 2
HETCH HETCHY WATER AND POWER*

COMPARISON OF BUDGETED AND ACTUAL EXPENDITURES (INCLUDING ENCUMBRANCES)
FISCAL YEAR 1977-78

<u>OE</u>	<u>DESCRIPTION</u>	<u>BUDGET</u>	<u>ACTUAL</u>	<u>-UNDER, OVER</u>
110	Permanent Salaries	\$ 808,368	\$ 767,509	\$ -40,859
110-1	Permanent Salaries - Crafts	1,160,413	1,072,563	-87,850
111	Overtime	15,680	14,147	-1,533
111-1	Overtime - Crafts	85,300	76,929	-8,371
112	Holiday Pay	2,620	2,609	-11
113	Extended Workweek	4,280	2,684	-1,596
113-1	Extended Workweek - Crafts	10,460	10,460	-
120	Temporary Salaries	57,288	33,750	-23,538
120-1	Temporary Salaries - Crafts	175,000	154,397	-20,603
139	Permanent Salaries - Gardenerers	54,566	54,535	-31
200	Contractual Services	84,327	77,218	-7,109
216	Maintenance and Repair of Autos	10,000	8,267	-1,733
231-1	Purchase of Power for Resale	30,600,000	29,926,961	-673,039
231-2	Service Charge for Transm. and Dist.	2,898,000	2,637,700	-260,300
251	Subsistence and Care of Persons	3,500	2,489	-1,011
269	Other Professional Services	64,500	62,564	-1,936
300	Materials and Supplies	171,402	183,780	-12,378
389	Subsistence	16,305	12,276	4,029
640	Water Rights and Damage Claims	1,000	-	-1,000
641	Hydrography	56,900	56,900	-
801	Accident Compensation	45,335	35,128	-10,207
804	Claims	500	-	-500
812	Fidelity Insurance	82	82	-
813	Automobile Insurance	28,734	28,734	-
814	Fire Insurance	35,027	35,027	-
815	Miscellaneous Insurance	43,315	39,498	-3,817
853	Assessments	48,614	40,304	-8,310
854	Membership Dues	366	559	193
855	Watershed Protection-Natl Park Service	10,000	10,000	-
855	Fee to U.S. Govt. - Raker Act	30,000	30,000	-
856	Maintenance of Roads - Raker Act	35,000	35,000	-
860	Retirement Allowances	646,316	646,316	-
862	Social Security	136,963	137,259	296
865	Health Service System	87,958	85,094	-2,864
870	Taxes	641,031	641,031	-
880	Rental of Offices	62,400	62,400	-
900	Services of Other Departments	935,191	929,194	-5,997
	TOTAL OPERATION AND MAINTENANCE	\$39,066,741	\$37,913,364	\$-1,153,377
400	Equipment	107,400	113,573	-6,173
500	Additions and Betterments	145,000	145,000	-
700	Facilities Maintenance	211,600	211,600	-
830	Bond Interest and Redemption	8,365,868	8,365,868	-
	TOTAL	<u>\$47,896,609</u>	<u>\$46,749,405</u>	<u>\$-1,147,204</u>

* Does not include Transit Power Division - Table 4 of Bureau of Light, Heat and Power - Table 11.

TABLE 3

TRANSIT POWER DIVISION

MOTIVE POWER SECTION - SUBSTATIONS

Substation	Type (a)	Date Installed	No. of Units	KW Size	Fiscal Year 1977-78	
					KWH	Converted to 600 V dc
Bryant	M-G	1910	3	1500	8,543,400	0
	M-G	1910	(b) 2	1500		
Turk	M-G	1910	3	1500	7,266,000	0
	M-G	1910	(b) 2	1500		
Downtown	SR	1976	1	4000)	7,910,400	
	SR	1977	1	4000)		
Eighth Avenue	SC	(c) 1921	1	1500)	279,400	0
	SC	(c) 1921	1	1500)		
	SC	1924	1	2000)		
West Portal	SR	1951	1	2000	4,306,800	
Outer Mission	MAR	1953	1	750	2,352,000	
Geneva	M-G	1910	3	1500	1,300	
Civic Center	SR	1976	2	4000	2,851,200	
Church	SR	1977	2	4000	3,272,800	
Judah	SR	1977	1	4000	883,200	
Fillmore	SR	1978	2	4000	1,660,800	
Carl	SR	1978	2	3000	5 528,000	
San Jose	SR	1978	1	4000	652,800	

TABLE 3 (Cont'd)

<u>Substation</u>	<u>Type (a)</u>	<u>Date Installed</u>	<u>No. of Units</u>	<u>KW Size</u>	<u>Fiscal Year 1977-78 KWH Converted to 600 V dc</u>
Randolph	SR	1978	1	3000	-
Taraval	SR	1978	1	4000	201,600
Laguna Honda	SR	1978	1	3000	-
					40,709,700

Notes: (a) Type of Conversion Equipment: M-G = Motor-Generator
SC = Synchronous Converter MAR = Mercury Arc Rectifier
SR = Silicon Rectifier

(b) Indicates units that are not serviceable. Units have not been repaired because of the high cost and because they are not needed to carry the present load. Also, it is planned to replace the conversion equipment with modern silicon rectifiers in the near future.

(c) Units were originally installed at Washington and Mason in 1914 and were moved to Eighth Avenue in 1921.

TABLE 4

HETCH HETCHY WATER AND POWER

TRANSIT POWER DIVISION

COMPARISON OF BUDGETED AND ACTUAL EXPENDITURES
(INCLUDING ENCUMBRANCES)

FISCAL YEAR 1977-78

<u>OE</u>	<u>DESCRIPTION</u>	<u>BUDGET</u>	<u>ACTUAL</u>	<u>-UNDER OVER</u>
110	Permanent Salaries	\$ 83,815	\$ 51,847	\$ -31,968
110-1	Permanent Salaries - Crafts	818,878	720,045	-98,833
111-1	Overtime - Crafts	99,700	103,720	4,020
112-1	Holiday Pay - Crafts	15,000	15,000	
120-1	Temporary Salaries - Crafts	10,000	7,108	-2,892
200	Contractual Services	10,864	2,849	-8,015
203	Use of Employees' Cars	2,900	2,588	-312
300	Materials and Supplies	53,598	42,997	-10,601
801	Accident Compensation	20,665	13,224	-7,441
860	Retirement Allowances	228,174	228,174	
862	Social Security	59,328	59,443	115
865	Health Service System	35,071	33,935	-1,136
900	Services of Other Departments	<u>195,785</u>	<u>207,670</u>	<u>11,885</u>
	TOTAL OPERATION AND MAINTENANCE	\$ 1,633,778	\$ 1,488,600	\$ -145,178
400	Equipment	<u>13,400</u>	<u>10,724</u>	<u>-2,676</u>
	TOTAL	<u>\$ 1,647,178</u>	<u>\$ 1,499,324</u>	<u>\$ -147,854</u>

TABLE 5

HETCH HETCHY WATER AND POWERCONSTRUCTION CONTRACTSFISCAL YEAR 1977-78

Contract No.	Description	Contractor	Contract Time		Original Contract Price	Value of Work Done During Fiscal Year
			Started	Completed		
HH-454	Moccasin Sewage Treatment Plant	Robars Constructors	8-29-77	-	\$222,090	\$233,859
HH-517	"K" Line Transit Power Facilities Street Lighting and Related Work	Amelco Electric	5-24-76	5-20-77	132,865	*
HH-521	Market Street Subway Electrification Embarcadero Station to Duboce Portal	Amelco Electric	7-14-75	11-18-77	1,077,000	92,803
HH-522	Civic Center, Church and Downtown Substations, Installation of Electrical Equipment	DeNarde Construction Co.	10-6-75	12-27-77	652,990	48,358
HH-523	Judah Street, 20th to 48th Avenues, Underground Power Facilities	L. K. Comstock & Co., Inc.	2-28-77	5-18-78	355,462	244,783
HH-524	K-Line Streetcar Overhead System, Conversion for Pantograph Operation	Amelco Electric	2-21-77	-	239,000	240,653
HH-528	Laguna Honda and Judah Substations, Construct Buildings and Install Equipment	Herrero Bros.	2-16-76	2-16-78	567,913	3,935
HH-529	Carl Substation, Construct Building and Install Equipment	S. J. Amoroso Construction Co., Inc.	7-19-76	5-26-78	597,800	189,655
HH-531	Market Street Subway Electrifica- tion, Duboce Junction to Eureka Station	Amelco Electric	4-26-76	6-23-78	195,428	6,508

TABLE 5 (Cont'd)

Contract No.	Description	Contractor	Contract Time		Original Contract Price	Value of Work Done During Fiscal Year
			Started	Completed		
HH-532	N - Line Streetcar Overhead System, Conversion for Pantograph Operation and Sunset Tunnel Electrification	Amelco Electric	11-28-77	-	\$441,552	\$ 130,878
HH-533	J-Line Streetcar Overhead System, Conversion for Pantograph Operation	L.K. Comstock & Co., Inc.	5-22-78	-	576,990	-
HH-536	Streetcar Overhead System, West Portal Avenue Conversion for Pantograph Operation	Mahoney Electric Co., Inc.	11-8-76	-	295,671	178,322
HH-540	Sutter, McAllister and Fillmore Streets, Underground Power Facilities and Related Work	Abbett Electric Corporation	11-8-76	-	238,495	48,608
HH-543	Repair, Reroof Hetch Hetchy Buildings, Moccasin and Early Intake	Western Roofing Service	10-4-76	7-11-77	48,664	2,085
HH-544	Fillmore Substation, Construct Building and Install Equipment	Herrero Bros.	9-13-76	1-31-78	651,840	112,944
HH-546	Randolph Substation, Construct Building and Install Equipment	Kaplan-Jones, Joint Venture	3-7-77	7-7-78	226,900	140,261
HH-547	San Jose Substation Install Equipment	L.K. Comstock & Co., Inc.	2-28-77	-	84,790	77,701
HH-548	Taraval Substation Construct Building and Install Equipment	Joseph DiGiorgio & Sons, Inc.	3-18-77	6-23-78	253,950	228,849
HH-549	Bryant Substation and Power Control Center, Construct Building and Install Equipment	Moore Construction Co.	4-24-78	-	1,020,000	68,000

TABLE 5 (Cont'd)

Contract No.	Description	Contractor	Contract Time		Original Contract Price	Value of Work Done During Fiscal Year
			Started	Completed		
HH-550R	West Portal Substation Install Equipment	Emil J. Weber Electric Co.	4-3-78	-	\$ 220,033	\$ 62,905
HH-552	J, N, No. 22 and No. 33 Line, Underground Power Facilities and Related Work	Ameico Electric	6-23-77	5-5-78	238,950	228,642
HH-553	Replace, Repair and Paint Steel Trolley Poles on Mission Street	Mahoney Electric Co., Inc.	12-6-76	11-20-77	89,984	16,958
HH-554	Construction of No. 47 Trolley Coach Loop at Army Street	Mahoney Electric Co., Inc.	10-18-76	2-13-78	31,110	3,384
HH-555	Red Mountain Bar, Surge Shaft Cover	National Bridge Co.	6-13-77	11-30-77	23,800	25,565
HH-557	Paint Steel Trolley Poles, Various Locations	Giampolini & Co.	3-28-77	2-15-78	37,200	26,745
HH-559	Howard and Folsom Streets, 11th Street to Main Street Underground Duct System	McGuire and Hester	11-15-76	11-16-77	629,735	271,468
HH-560	Haight Street, Stanyan to Gough, Underground Duct System	Underground Construction Co., Inc.	5-2-77	9-16-77	329,847	182,630
HH-561	Fillmore, Jackson, Presidio and Other Streets, Underground Duct System	W. R. Thomason, Inc.	1-31-77	10-7-77	614,000	62,882
HH-562	Fulton and McAllister Streets 8th Avenue to Divisadero Street Underground Duct System	Amalgamated Superior Engineering, Inc.	7-5-77	1 20-78	312,275	282,040

TABLE 5 (Cont'd)

Contract No.	Description	Contractor	Contract Time		Original Contract Price	Value of Work Done During Fiscal Year
			Started	Completed		
HH-564	Moccasin and Tesla Portal Buildings, Exterior Painting and Roof Preservative	Ross F. Porter	12-13-76	7-15-77	\$ 50,400	\$ 554
HH-567	Hayes Street, Stanyan to Van Ness Underground Duct System	Underground Construction Co.	9-12-77	3-7-78	363,288	336,089
HH-568	Moccasin Vehicle Refueling Station	Eagan and Paradiso Construction, Co.	11-21-77	4-5-78	24,868	25,250
HH-570	Surface Roads and Areas, Moccasin Area	George Reed, Inc.	6-5-78	-	24,815	16,085
HH-573	Replace, Repair and Paint Trolley Poles, Various Locations	Mahoney Electric Co., Inc.	8-8-77	-	146,386	142,512
HH-578	Ocean, San Jose and Onondaga Avenues, Underground Power Facilities and Related Work	L.K. Comstock & Co. Inc.	3-27-78	-	123,185	18,246
HH-579	Union Street, Parnassus Avenue, Clayton, Street, and Ashbury Street, Underground Duct System	Homer J. Olsen, Inc.	11-28-77	6-9-78	318,350	307,636
HH-580	Mission, Bryant, Alameda, 16th, 14th, and 8th Streets, and South Van Ness Avenue, Underground Duct System	Underground Construction Co., Inc.	4-3-78	-	530,353	282,682
MR 644	M Line Track Extension and Sewer Enlargement on Broad Street and San Jose Avenue	Homer J. Olsen, Inc.	6-13-78	-	118,250	44,100

TABLE 5 (Cont'd)

<u>Contract No.</u>	<u>Description</u>	<u>Contractor</u>	<u>Contract Time Started</u>	<u>Completed</u>	<u>Original Contract Price</u>	<u>Value of Work Done During Fiscal Year</u>
DPW 23,727	Ocean Avenue and Phelan Avenue Rechannelization and Track Reconstruction	Homer J. Olsen, Inc.	11-10-76	2-1-78	\$107,353	\$ 70,607
DPW 23,919	Judah Street, 19th Avenue to 32rd Avenue, Street Improvement and Track Reconstruction	Bay Cities Paving & Grading, Inc.	12-7-77	-	173,923	106,965
DPW 23,920	Judah Street, 32nd to La Playa, Street Improvement and Track Reconstruction	Homer J. Olsen, Inc.	12-7-77	-	214,190	142,296
* ACCEPTED BY PUC 3-28-78					Total for Fiscal Year 1977-78	\$4,704,443

TABLE 6
HETCH HETCHY WATER SUPPLY

SEASON PRECIPITATION (INCHES)		PRECIPITATION, RUNOFF, STORAGE AND DELIVERY AS OF JUNE 30 BY FISCAL YEARS				
		Normal	1973-74	1974-75	1975-76	1976-77
Hetch Hetchy		33.79	38.46	39.15	21.80	18.53
Lake Lloyd		44.75	57.45	47.86	24.91	21.10
Approx. Percent of Normal		100%	112%	107%	58%	50%
WATERSHED RUNOFF (ACRE-FT.) (a)						1977-78
Hetch Hetchy		717,365	871,240	769,239	376,347	210,851
Lake Lloyd)		419,663	533,923	450,131	229,041	123,372
Lake Eleanor)						
Total		1,137,033	1,405,163	1,219,370	605,388	334,223
Approx. Percent of Normal			121%	105%	52%	29%
RESERVOIR STORAGE (ACRE-FT.) (a)						1977-78
Hetch Hetchy		360,360	360,163	327,963	201,576	154,040
Lake Lloyd		268,800	268,284	239,909	154,439	135,507
Lake Eleanor		27,100	26,726	26,823	2,563	1,043
Total		656,260	655,173	594,695	358,578	290,590
DELIVERY TO SFWD (ACRE-FT.) (a) (b) (c)						
Average per day			532	675	588	747
Maximum per day			850	925	934	944
Total for fiscal year			193,518	246,514	215,726	273,450
						159,385

NOTES: (a) One acre-foot equals 325,900 gallons or approximately 1/3 million gallons.
 (b) Includes delivery to Livermore site, U.S. Atomic Energy Commission.
 (c) Total since operation of Hetch Hetchy Aqueduct began in 1934: 5,237,311 acre-feet.

TABLE 7
HETCH HETCHY POWER SYSTEM

ELECTRIC ENERGY GENERATED, PURCHASED, AND DISTRIBUTED
FISCAL YEAR 1977-78

<u>PLANT DATA</u>	<u>Nameplate Rating</u> <u>(Kilowatts)</u>	<u>Capability</u> <u>(Kilowatts)</u>	<u>Annual Plant</u> <u>Factor - %</u>
Moccasin Powerhouse	90,000	104,000	50.7
Dion R. Holm Powerhouse	135,000	150,000	51.2
Robert C. Kirkwood Powerhouse	<u>67,500</u>	<u>85,000</u>	67.1
Total	292,500	339,000	

ENERGY GENERATED AND PURCHASED (KILOWATT-HOURS)

<u>Gross Generation</u>			
Moccasin Powerhouse	399,590,000		
Dion R. Holm Powerhouse	605,083,000		
Robert C. Kirkwood Powerhouse	<u>396,937,000</u>		
			1,401,610,000
<u>Station Service</u>			
Moccasin Powerhouse	823,800		
Dion R. Holm Powerhouse	869,990		
Robert C. Kirkwood Powerhouse	<u>552,410</u>		
			<u>2,246,200</u>
<u>Net Generation</u>			1,399,363,800
<u>Supplementary Energy</u>			
"Bank" Withdrawal*			21,458,861
Purchase (PGandE)			<u>1,005,795,856</u>
Total			<u><u>2,426,618,517</u></u>

ENERGY DISTRIBUTED (KILOWATT-HOURS)

<u>Sales</u>			
Municipal Accounts			489,325,403
Modesto Irrigation District			1,001,443,706
Turlock Irrigation District			576,535,724
Kaiser Cement and Gypsum Corp.			48,214,351
Kaiser Aluminum and Chemical Corp.			17,640,000
Norris Industries, Inc.			3,498,307
Lockheed Missiles and Space Co. Inc.			52,819,023
General Motors Corporation			38,358,000
IBM Corporation			32,299,200
Liquid Air, Inc.			17,358,000
Miscellaneous Customers			761,100
<u>Non-Revenue</u>			
Project Use			2,841,847
"Bank" Deposit*			69,477,933
<u>Losses</u>			
Hetch Hetchy System			46,659,346
PGandE System (Municipal Accounts)			<u>29,386,577</u>
Total			<u><u>2,426,618,517</u></u>

* In accordance with letter-agreement between City and PGandE dated 6/24/75

TABLE 8

HETCH HETCHY POWER SYSTEM

COMPARATIVE ELECTRIC ENERGY SALES TO CUSTOMERS
FISCAL YEARS 1976-77 AND 1977-78
 (Nearest 100,000 Kilowatthours)

<u>CUSTOMER</u>	<u>1976-77</u>	<u>1977-78</u>
Municipal Accounts		
International Airport	195,200,000	191,800,000
Municipal Railway	62,300,000	66,900,000
Public Works	26,000,000	26,100,000
Street Lighting	46,000,000	45,700,000
Unified School District	39,100,000	41,300,000
Water Department	44,900,000	30,800,000
Other City Departments	86,300,000	86,700,000
Modesto Irrigation District	1,013,500,000	1,001,500,000
Turlock Irrigation District	592,000,000	576,500,000
Kaiser Cement and Gypsum Corp.	0	48,200,000
Kaiser Aluminum and Chemical Corp.	0	17,600,000
Norris Industries, Inc.	2,100,000	3,500,000
Lockheed Missiles & Space Co., Inc.	0	52,800,000
General Motors Corporation	0	38,400,000
IBM Corporation	0	32,300,000
Liquid Air, Inc.	0	17,400,000
Miscellaneous Customers	<u>800,000</u>	<u>800,000</u>
TOTAL	<u>2,108,200,000</u>	<u>2,278,300,000</u>

TABLE 9

HETCH HETCHY POWER SYSTEM

COMPARATIVE GROSS REVENUE RECEIVED FROM SALE OF ELECTRIC ENERGY
FISCAL YEARS 1976-77 AND 1977-78
(Nearest \$1,000)

<u>CUSTOMERS</u>	<u>1976-77</u>	<u>1977-78</u>
Municipal Accounts		
International Airport	\$ 3,081,000	\$ 5,377,000
Municipal Railway	781,000	1,068,000
Public Works	359,000	460,000
Street Lighting	559,000	747,000
Unified School District	612,000	783,000
Water Department	509,000	636,000
Other City Departments	1,126,000	1,503,000
Modesto Irrigation District	20,982,000*	19,979,000*
Turlock Irrigation District	12,484,000*	12,220,000*
Kaiser Cement and Gypsum Corp.	124,000	1,908,000
Kaiser Aluminum and Chemical Corp.	35,000	689,000
Norris Industries, Inc.	32,000*	44,000*
Lockheed Missiles & Space Co. Inc.	134,000	1,979,000
General Motors Corporation	37,000	1,446,000
IBM Corporation	60,000	1,211,000
Liquid Air, Inc.	17,000	624,000
Miscellaneous Customers	10,000	10,000
TOTAL	<u>\$40,942,000</u>	<u>\$50,684,000</u>

* Indicates amount as paid by customer

TABLE 10
HETCH HETCHY POWER SYSTEM

ELECTRIC ENERGY GENERATED, PURCHASED, AND DISTRIBUTED BY FISCAL YEARS --- KILOWATT-HOURS

NET GENERATION					
	1972-73	1973-74	1974-75	1975-76	1976-77
Moccasin Powerhouse	542,886,200	554,418,600	539,122,000	459,718,300	329,656,200
Dion R. Holm Powerhouse	653,141,570	818,867,290	875,047,560	655,980,250	134,916,710
Robert C. Kirkwood Powerhouse	601,147,890	616,788,400	640,097,630	522,119,850	243,624,410
Subtotal	1,797,175,660	1,990,074,290	2,054,267,190	1,637,818,400	708,197,320
1,399,363,800					
SUPPLEMENTAL ENERGY					
"Bank" Withdrawal*	0	36,435,281	123,458,969	36,545,220	0
Purchase (PG&E)	351,288,448	44,401,773	0	247,922,311	1,468,919,029
Subtotal	351,288,448	80,837,054	123,458,969	284,467,531	1,468,919,029
TOTAL	2,148,464,108	2,070,911,344	2,177,726,159	1,922,285,931	2,177,116,349
2,426,618,517					
DISTRIBUTION					
Sales					
Municipal Accounts	508,259,909	482,482,697	481,275,895	490,203,242	499,833,145
Modesto Irrigation District	858,816,000	787,392,000	734,880,000	865,104,000	1,013,509,726
Turlock Irrigation District	421,484,000	302,784,000	219,120,000	248,817,883	591,956,719
Kaiser Cement & Gypsum	145,368,000	156,720,000	143,688,000	78,351,659	0
Kaiser Aluminum & Chemical	31,521,600	31,320,000	28,137,600	11,280,000	0
Norris Industries, Inc.	22,325,760	22,502,016	21,695,155	7,167,744	2,058,278
Lockheed Missiles	---	39,556,800	209,304,000	80,177,458	0
General Motors	---	---	75,978,000	28,837,778	0
IBM Corporation	---	---	82,047,387	25,761,600	0
Liquid Air, Inc.	---	---	28,139,425	12,547,200	0
Miscellaneous Customers	847,858	733,633	809,002	920,851	824,292
					761,100
Non-Revenue					
Project Use	4,003,796	3,266,691	3,264,541	3,277,963	2,965,669
"Bank" Deposit*	28,985,698	130,908,552	33,771,707	2,773,513	0
Losses	126,851,487	113,244,955	115,615,447	67,065,040	65,968,520
TOTAL	2,148,464,108	2,070,911,344	2,177,726,159	1,922,285,931	2,177,116,349
					2,426,618,517

*In accordance with letter-agreement between City and PG&E dated June 24, 1975.

TABLE 11
BUREAU OF LIGHT, HEAT AND POWER

COMPARISON OF BUDGETED AND ACTUAL EXPENSITURES AND RECEIPTS
(INCLUDING ENCUMBRANCES)

FISCAL YEAR 1977-78

<u>OE</u>	<u>DESCRIPTION</u>	<u>BUDGET</u>	<u>ACTUAL</u>	<u>-UNDER +OVER</u>
<u>EXPENDITURES</u>				
110	Permanent Salaries	\$ 180,536	\$ 135,780	\$ -44,756
111	Overtime	652	314	-338
112	Holiday Pay	392	392	0
200	Contractual Services	1,400	1,393	-7
231	Lighting and Heating of Public Buildings - General	4,141,118	3,100,521	-1,040,597
231-1	Lighting and Heating of Public Buildings - Special Fund	10,086,232	10,289,264	+203,032
231-2	Lighting of Public Streets - Pacific Gas and Electric Co.	868,950	729,520	-139,430
231-3	Lighting of Public Streets - Hetch Hetchy	543,222	675,795	+132,573
231-4	Lighting of Public Streets - Calif. Division of Highways	23,398	29,238	+5,840
300	Materials and Supplies	500	499	-1
400	Equipment	0	0	0
813	Auto Insurance	222	222	0
860	Retirement Allowance	34,976	25,798	-9,178
862	Social Security	8,120	5,707	-2,413
865	Health Service System	7,375	6,397	-978
954	EDP - PUC Data Processing	12,615	12,615	0
TOTAL		<u>\$ 15,909,708</u>	<u>\$ 15,013,455</u>	<u>\$ -896,253</u>
<u>RECEIPTS</u>				
	Interfund Receipts*	\$ 11,626,594	\$ 10,435,121	\$ -1,191,473
	Ad Valorem Taxes	<u>4,283,114</u>	<u>4,578,334</u>	<u>+295,220</u>
TOTAL		<u>\$ 15,909,708</u>	<u>\$ 15,013,455</u>	<u>\$ -896,253</u>

WORK ORDER APPROPRIATIONS FROM ROAD FUND

<u>DESCRIPTION</u>	<u>TOTAL FUNDS</u>	<u>EXPENDITURE</u>	<u>-UNDER +OVER</u>
Maintenance and Repair of Street Lighting Installation	\$ 275,000	\$ 279,794	\$ +4,794

* Transfers from other Departments.

TABLE 12
BUREAU OF LIGHT, HEAT AND POWER
EXPENDITURE FOR ELECTRICITY FOR MUNICIPAL PURPOSES
FISCAL YEAR 1977-1978

DEPARTMENT	NO. OF ACCOUNTS	CONSUMPTION KILLOWATT-HOUR	EXPENDITURES
Art Commission	4	243,960	5,215
Art Museum	1	1,252,560	21,205
Auditorium and Brooks Hall	1	4,996,400	86,837
Child Care Centers	12	272,222	6,111
City Demonstration Agency	1	198,560	4,070
City Planning	1	67,140	1,419
De Young Museum	1	3,444,800	55,074
Disaster Corp.	1	78	1,351
Electricity	5	841,993	13,991
Farmer's Market	1	25,969	586
Fire	59	2,955,819	62,332
Hassler Health Home	1	161,400	3,154
Health	43	28,943,229	420,272
Hetch Hetchy	7	131,738	3,067
Hidden Valley Ranch	1	804,960	14,629
International Airport (a)	18	191,823,356	5,376,613
Junior College District	27	8,328,005	138,146
Juvenile Hall	2	1,338,737	21,596
Legion of Honor	1	557,600	9,848
Library	31	2,402,503	46,524
Log Cabin Ranch	13	317,827	7,833
Municipal Railway	84	66,924,481	1,068,011
Parking Authority	18	177,648	4,050
Police	15	814,023	17,164
Public Buildings	7	16,395,939	244,459
Public Works	111	25,738,871	450,295
Purchasing	5	610,627	10,629
Real Estate	4	222,915	6,903
Recreation and Park	208	9,296,729	187,844
Recreation and Park - Candlestick Park	3	2,100,648	111,184
Recreation and Park - Yacht Harbor	32	1,147,133	25,394
Sheriff	3	1,109,600	17,792
Social Services	3	792,456	13,800
Street Lighting Operations (.003)	1	45,737,934	724,795
Unified School District	215	32,924,049	644,623
War Memorial	2	1,612,720	29,163
Water	126	30,833,276	635,653
TOTAL MUNICIPAL DEPARTMENTS	1,068	485,547,905	10,491,132
Academy of Sciences	2	3,462,102	53,248
State of California: Street Lighting	1	(b)	22,631
Traffic Devices	1	315,396	6,607
GRAND TOTAL FROM HETCH HETCHY	1,072	489,325,403	10,573,618

Notes: (a) Including 152,224,799 KWH resold at commercial rates for \$3,942,491 to Airport tenants

(b) Included under Street Lighting Operations.

TABLE 13BUREAU OF LIGHT, HEAT AND POWEREXPENDITURE FOR GAS FOR MUNICIPAL PURPOSESFISCAL YEAR 1977 - 1978NATURAL GAS

<u>DEPARTMENT</u>	<u>NO. OF ACCOUNTS</u>	<u>CONSUMPTION THERMS</u>	<u>EXPENDITURES</u>
Art Commission	2	16,547	3,660
Auditorium and Brooks Hall	2	1,089	266
Child Care Centers	11	24,781	5,553
City Demonstration Agency	1	10,303	2,266
City Planning	1	4,151	921
De Young Museum	1	248,318	54,321
Electricity	2	38,143	8,368
Farmer's Market	1	223	63
Fire	53	422,745	93,103
Hassler Health Home	1	644	169
Health	33	5,548,117	1,244,734
Hetch Hetchy	2	1,221	295
International Airport	6	1,263,323	287,455
Junior College District	18	951,799	208,129
Juvenile Hall	3	388,560	84,984
Legion of Honor	1	48,584	10,635
Library	28	91,187	20,300
Municipal Railway	14	347,749	72,699
Police	11	39,853	8,854
Public Buildings	5	1,215,595	277,025
Public Works	15	240,004	57,079
Purchasing	3	34,958	7,686
Real Estate	1	299	101
Recreation and Park	104	1,032,061	227,021
Recreation and Park - Candlestick Park	1	85,036	18,595
Registrar of Voters	1	3,161	704
Sheriff	3	435,502	91,928
Social Services	2	26,001	5,727
Unified School District	208	3,456,263	758,689
War Memorial	3	208,163	45,561
Water	10	115,948	25,492
TOTAL MUNICIPAL DEPARTMENTS	549	16,300,328	3,622,383

STEAM

(Does not include steam generated by City)

<u>DEPARTMENT</u>	<u>NO. OF ACCOUNTS</u>	<u>CONSUMPTION THERMS</u>	<u>EXPENDITURE</u>
Health (a)	1	184,600	1,064

Notes: (a) New Account

TABLE 14
BUREAU OF LIGHT, HEAT AND POWER
STREET LIGHTS IN SERVICE
JUNE 30, 1978

<u>SIZE & TYPE OF LAMP</u>	<u>COMPANY- OWNED</u>	<u>JOINTLY- OWNED</u>	<u>CITY- OWNED</u>	<u>TOTAL</u>
<u>UNDERGROUND CONNECTION</u>				
<u>High Voltage Series Circuit</u>				
1,000-Lumen Incandescent	---	22	---	22
2,500 " "	243	24	57	324
4,000 " "	852	122	1,040	2,014
6,000 " "	570	445	2,061	3,076
10,000 " "	420	17	512	949
400-Watt Mercury Vapor	3	43	231	277
175 " " "	---	---	3	3
250 " " "	2	---	79	81
<u>Low Voltage Multiple Circuit</u>				
1,000-Lumen Incandescent	---	---	49	49
2,500 " "	8	3	50	61
4,000 " "	166	5	109	280
6,000 " "	32	5	83	120
10,000 " "	8	---	14	22
5,500 " Fluorescent	---	---	21	21
23,000 " "	38	---	2	40
100-Watt Mercury Vapor	---	---	111	111
175 " " "	92	---	3,865	3,957
250 " " "	37	---	1,735	1,772
400 " " "	305	---	4,823	5,128
700 " " "	---	---	366	366
1,000 " " "	---	---	97	97
150-Watt Sodium Vapor	---	---	206	206
250 " " "	---	---	378	378
400 " " "	---	---	658	658
<u>OVERHEAD CONNECTION</u>				
<u>High Voltage Series Circuit</u>				
2,500-Lumen Incandescent	1	---	---	1
4,000 " "	11	---	---	11
<u>Low Voltage Multiple Circuit</u>				
2,500-Lumen Incandescent	2	---	---	2
4,000 " "	58	---	49	107
6,000 " "	8	---	---	8
175-Watt Mercury Vapor	14,678	---	4	14,682
250 " " "	1,914	---	---	1,914
400 " " "	807	---	---	807
TOTAL, JUNE 30, 1978	<u>20,255</u>	<u>686</u>	<u>16,603</u>	<u>37,544</u>
	54.0%	1.8%	44.2%	100%
TOTAL, JUNE 30, 1977	20,298	691	16,457	37,446
NET CHANGE DURING THE YEAR	-43	-5	146	98

TABLE 15

BUREAU OF LIGHT, HEAT AND POWEREXPENDITURES FOR OPERATION AND MAINTENANCE OF STREET LIGHTING
FISCAL YEAR 1977 - 78CONTRACTUAL SERVICEP. G. & E. Company

Company-owned facilities (a)	699,037	
Jointly-owned facilities (a)	18,894	
City-owned facilities (b)	<u>11,589</u>	729,520
Emergency service to City owned facilities		<u>8,194</u>

Lease-Lite Corporation

Group lamp replacement - City-owned facilities		70,017
--	--	--------

Lease-Lite Corporation

Maintenance and repair - City-owned facilities		
Routine maintenance	44,881	
Repair of damage caused by accidents (c)	58,309	
Repair of damage caused by equipment failure	46,290	
Repair of damage caused by vandals	<u>2,600</u>	152,080

MATERIAL AND SUPPLIES (FURNISHED BY CITY)

Damage caused by accidents (c)	44,113	
Damage caused by equipment failure	11,882	
Damage caused by vandals	<u>2,097</u>	58,092

ELECTRIC ENERGY (HETCH HETCHY)

36,460,727 KWH at \$0.04116/KWH less 60.4% discount		594,287
9,277,207 KWH at \$0.04724/KWH less 64.9% discount		153,828

TOTAL EXPENDITURE		<u>1,766,018</u>
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LESS AMOUNT PAID TO HETCH HETCHY FROM:

Gas Tax Funds for State Highway Routes	22,631	
Recreation and Park Department for off-street lighting	<u>2,796</u>	25,427

TOTAL NET EXPENDITURE		<u><u>1,740,591</u></u>
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AVERAGE OPERATING COST

Based on number of lights in service June 30, 1978, average total cost of operation, maintenance and repair per light per year:		<u><u>46.36</u></u>
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- NOTES: (a) Includes maintenance, repair, fixed charges and electric energy for Company-owned facilities.
- (b) Includes replacement of individual lamp and broken glassware, service and switching charges, and electric energy.
- (c) When responsible party is known, claim is filed for recovery of cost.

TABLE 16
BUREAU OF LIGHT, HEAT AND POWER
NEW CITY-OWNED STREETLIGHTING INSTALLATIONS
COMPLETED DURING FISCAL YEAR 1977-78

<u>Locations</u>	<u>Number of Lights</u>	<u>Type of Lights*</u>	<u>Value</u>
Financed by Bond Issues:			
Crossover Dr. and Park Presidio Bypass	96	SV	232,648
Army 2nd 24th St.	137	MV	92,200
Kezar Drive	44	MV	57,128
Alemany Blvd.-Mission St. to San Jose	98	SV	237,692
Irving St.-7th to 22nd Ave.	48	MV	96,524
Laguna Honda and Woodside Area	53	MV	50,100
Lakeside Area	<u>61</u>	MV	<u>135,500</u>
Total	537		901,792
Financed by State Gasoline Tax:			
Turk - Van Ness Ave. to Gough St.	6	MV	11,793
Grand Total	543		913,585

*MV - Mercury Vapor

SV - Sodium Vapor (High Pressure)

BUREAU OF LIGHT, HEAT AND POWER

HISTORICAL COST OF CITY-OWNED STREET LIGHTING IMPROVEMENTS

Fiscal Year	Ad Valorem Taxes	Gasoline Taxes	Street Lighting Bonds	Property Owners	State Highway Dept.	Miscellaneous Sources*
Prior to July 1, 1953	\$1,748,675	\$ 617,115	-	\$576,404	\$ 22,650	\$477,651
1953-54	142,151	22,181	-	23,495	2,274	1,239
1954-55	155,727	30,817	-	748	16,578	543
1955-56	15,704	48,620	-	2,484	19,181	1,360
1956-57	114,168	26,641	-	7,256	-	3,003
1957-58	2,501	64,942	-	18,199	4,142	-
1958-59	-	171,367	-	10,231	626	538
1959-60	-	100,126	-	35,874	10,242	4,083
1960-61	-	82,074	-	19,236	-	1,865
1961-62	-	200,113	-	116,376	24,550	7,994
1962-63	-	84,328	-	21,700	-	-
1963-64	-	340,108	-	32,556	6,000	-
1964-65	-	97,846	-	8,975	50,857	-
1965-66	-	474,673	\$ 522,899	-	-	-
1966-67	-	111,164	188,312	5,000	-	-
1967-68	-	175,949	331,941	-	-	-
1968-69	-	374,229	616,722	-	40,250	-
1969-70	-	359,635	261,000	-	-	-
1970-71	-	490,031	1,550,442	-	-	-
1971-72	-	541,534	1,810,011	-	-	-
1972-73	-	451,614	-	-	-	-
1973-74	-	266,764	236,314	-	-	-
1974-75	-	297,318	123,115	-	-	-
1975-76	-	347,870	376,928	-	-	-
1976-77	-	23,833	1,161,045	-	-	-
1977-78	-	11,793	913,585	-	-	-
Totals	\$2,178,926	\$5,776,685	\$8,092,314	\$878,534	\$197,350	\$498,275
Less: Cost of portions removed prior to fiscal year 1976-77						\$2,041,699
Cost of portions removed during fiscal year 1977-78						134,978
						\$17,622,084

Original cost of City-owned facilities in service on June 30, 1978

* Includes WPA and PWA (1935-1942). Boulevard Construction (1932-1934)
Municipal Railway, Recreation and Park Department and Housing

